

بسم الله الرحمن الرحيم

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The Ability of Forecasting Value at Risk (VaR) in Estimating Expected Return :Evidence from Amman Stock Exchange (ASE) during the Period (2005-2009)

مقدرة التنبؤ بالقيمة عند الخطر في تقدير العائد المتوقع : دليل من بورصة عمان خلال الفترة (2005-2009)

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إعداد:

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أستاذ مشترك في المالية والمصرفية جامعة اليرموك

الأستاذ الدكتور وليد محمود حميدات .... عضواً

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أستاذ مساعد / مدير البنك المركزي فرع اربد

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Abbreviations list

The Abbreviating	The Explanation
ASE	Amman Stock Exchange
VaR	Value at Risk
CVaR	Conditional Value at Risk
CRSP	Centre of Research in Security Price
NYSE	New York Stock Exchange
U.S.	United State
P&L	Profit and Loss
EVD	Extreme Value Distribution
RM	Risk Management
LEL	Limited Expected Loss
CRRA	Constant Relative Risk Aversion
MEL	Mean Excess Loss
TF	Transfer Function
BIS	Bank for International Settlements
CAPM	Capital Asset Pricing Model
NYU	New York University
MC	Monte Carlo
RAROC	Model use to Calculate VaR
JSC	Jordan Security Commission
SDC	Security Depositary Center
CEO	Chief Executive Officer
FTSE	The Financial Times and London Stock Exchange
AMEX	American Stock Exchange
STOXX	Indices

Abstract

Al-Qawaqneh, Shatha Adel. The Ability of Forecasting Value at Risk (VaR) in Estimating Expected return. Master Thesis, Yarmouk University, Department of Banking and Finance, 2010 (Supervisor: Dr. Moh'd Ajlouni).

This study aims to identify the ability of Forecasting Value at Risk (VaR) in Estimating the expected return in Amman Stock Exchange (ASE), for all indices and all sectors. The Study tries to provide a comprehensive idea about VaR as a risk assessment. The study investigates the relationship between the expected return and VaR. As well as, it calculated the daily expected return, standard deviation and VaR , then used a linear regression to show the relationship. The results showed that there is a correlation between the expected return and VaR.

The study implemented some recommendations that are necessary to search in this topic, also it recommends using VaR in several fields as a risk assessment .

Key Words : Value at Risk, Amman Stock Exchange, Risk, Expected Returns.

Chapter One

General Framework

1.1 Introduction

During 1990s, Value at Risk (VaR) was widely adopted for measuring market risk in trading portfolios. Its origins can be traced back as far as 1922 to capital requirement, the New York Stock Exchange imposed on member firms. VaR also has roots in portfolio theory and a crude VaR measure published in 1945.

The most popular and traditional measure of risk is volatility. But the main problem with volatility, however, that it does not care about the direction of an investment movement. For investors, risk is about the odds of losing money. A VaR model measures market risk by determining how much the value of the portfolio, firm, bank or any financial institution could decline over a given period of time with a given probability as a result of change in market price or rate of return. VaR model aggregates several components of price risk into a single quantitative measure of the potential of loss over specific time horizon. This model is clearly appealing, because it conveys the market risk of the entire portfolio in one number.

Moreover, VaR focuses directly, and in dollar term, on the measure for assessing risk. VaR is becoming a standard risk management tool for institutions worldwide, and is enjoining a rapid and wide-ranging success. Its main appeal lies in its simplicity. A single number offers information about what the

firm may expect to lose over a time horizon, uncover uncertainties of the firm and provides investors, auditors and rating agencies.

VaR considered as a lower tail percentile for the distribution of profit and loss. Some scientist called the VaR a new science of risk management . But we can consider it as a statistical measure of likely loss during a given business time interval such as trading day.

In general, VaR model attempt to forecast the time varying distribution of portfolio returns, and estimates the lower quintiles of these distribution. The two most important component of the VaR model are the length of time over which market risk is to be measured and confidence level at which market risk is measured.

The Indices in the ASE are Free Float Index, Weighted Index and Unweighted index .

1.2 Importance of The Study

The importance of this study comes from the VaR itself, because it has emerged as a major tool for measuring market risk.

To the best of the researcher knowledge, this study is among the first who measures VaR in the Jordanian market .

1.3 Objective of the Study

The main objectives of this study are to :

1- Learn about the value at risk as a management risk tool.

2- Compute VaR.

3-Examine the effect of the VaR as a measurement of risk on estimate the expected return .

4- Investigating the ability of VaR in Forcasting the expected Index rate of return .

5- Evaluate the performance of the ASE during the period .

1.4 Limitation of the study

The Main limitations of the study come from the data and model. This study uses a five year period which might not be sufficient to generalize on it.

1.5 Question of the study

In order to achieve the study objectives, this study will try to answer the following question :

1- Is there any relationship between the VaR and expected return of the main indices for the all sector ?

2- if so, what is the direction of this relation ?

1.6 Hypotheses of the Study

1- There is a positive relationship between the VaR and Free Float index return of the General sector .

2- There is a positive relationship between the VaR and Free Float index return of the Financial sector .

3- There is a positive relationship between the VaR and Free Float index return of the Industrial sector .

4- There is a positive relationship between the VaR and Free Float index return of the Services sector .

5- There is a positive relationship between the VaR and weighted index return of the General sector .

6- There is a positive relationship between the VaR and weighted index return of the Banks sector .

7- There is a positive relationship between the VaR and weighted index return of the Insurance sector .

8- There is a positive relationship between the VaR and weighted index return of the Industrial sector .

9- There is a positive relationship between the VaR and weighted index return of the Services sector .

10- There is a positive relationship between the VaR and Unweighted index return of the General sector .

11- There is a positive relationship between the VaR and Unweighted index return of the Banks sector .

12- There is a positive relationship between the VaR and Unweighted index return of the Insurance sector

13- There is a positive relationship between the VaR and Unweighted index return of the Industrial sector.

14- There is a positive relationship between the VaR and Unweighted index return of the Services sector.

1.7 Methodology of the Study

In this study we use the price index of all sectors in the three indices during the period (2005-2009). Then we calculated the expected return for daily index price and standard deviation and VaR , then we used the linear regression using excel, between the index return and VaR.

1.8 Structure of the Study

This Study Consists of Seven chapters, In addition to this chapter one, which provided a general framework of the study, chapter two, discuss the literature review of the studies, chapter three, explain the theoretical back ground of the study, chapter four, gives an information about Amman Stock Exchange, chapter five, explain the data and methodology that followed in this study, then chapter six, provided the data analysis, finally chapter seven, consist of the results and the recommendation.

Chapter Two

Theoretical Background

2.1 Introduction

In nowadays financial world, Value at Risk (VaR) has become one of the most important and mostly used measures of risk.

As a risk management technique, VaR describes the loss that can occur over a given period, at a given confidence level, due to exposure to market risk.

The simplicity of the VaR concept has directed many to conclude that it become a standard risk measure, not only for financial establishment involved in large scale trading operations, but also for institutional investors and non-financial enterprises.

VaR has become an inalienable tool of risk control and integral part of methodologies that diapers of capital between various business spheres.

The Bank for International Settlements (BIS) encourage commercial banks to use VaR as a measure of risk.

This chapter will provide general background on VaR. This include tracing its history, defining VaR, explaining its name, , its importance, computation, measurements and approaches and its limitations .

2.2 History of Value-at-Risk

VaR has developed as a risk assessment tool at banks and other financial service firms in the last decade. While the term "Value at Risk" was not widely used prior to the mid 1990's, the origins of the measure lie, further back in time. Its origins can be traced back as far as 1922 to the capital requirement that New York Stock exchange imposed on a number of firms. VaR also has roots in portfolio theory and a crude VaR measure published in 1945.

Markowitz (1952) and, three months later, Roy (1952) independently published VaR measures that were surprisingly alike. Each was working to developed means of selecting portfolios that would , in some sense, optimize reward for a given level of a risk. For this propose, each proposed VaR measures that incorporated covariance's between risk factors in order to reflect hedging and diversification effects .

While the two measures were mathematically similar, they support different VaR measurement.

Markowitz used the variance of simple return metric. But Roy used a metric of shortfall risk that represent an upper bounded on the probability of the portfolio's gross return being less then some specified "catastrophic return".

Both Markowitz and Roy skirted the issue of how probabilistic assumptions might be specified. Roy's VaR measure required a

mean vector and covariance matrix for risk factors. He observed that these must be "estimated from information about the past". Markowitz's VaR measure required only a covariance matrix for risk factors. Markowitz and Roy intended their VaR measures for practical portfolio optimization work. Markowitz (1959) book is a "How- to " guide to his optimization scheme, boldly describing for a non financial audience computations that would remain infusible until processing power become more available during the 1970's.

Markowitz was aware of this problem and proposed a more tractable VaR measure that employed a diagonal covariance matrix.

William Sharpe describe this VaR measure in his Ph.D. thesis and (1963) paper. The measure is different form but helped motivation Sharpe's (1964) Capital Asset Praising Model (CAPM).

Because of the limited availability of processing power, VaR measures from this period were largely theoretical, and were published primary in the context of the emerging portfolio theory. This encompassed the work of Tobin (1958), Treynor (1961), Sharpe (1964), Lintner (1965), and Mossin (1966). The VaR measured they employed were best studied for equity portfolios. There were few alternative assets categories, and applying VaR to these would have raised a number of modeling issues. Schrock (1971) and Dusak (1972) described simple VaR measures for

futures portfolios, but neither addressed term structure or seasonality issues. Since world war II, most currencies had developed at some point; may had done so several times.

Governments were secretive about planned devaluations, so corporations maintained ongoing hedges. It incorporated a VaR measure with a variance of market value VaR metric. It assumed devaluations occurred randomly, with the conditional magnitude of devaluation being normally distributed.

As the 1970s tamed to the 1980s markets were becoming more volatile.

Firms were becoming more leveraged, and the need for financial risk measures, such as VaR, was growing. The resources to implement VaR were becoming available, but VaR remained primarily a theoretical tool of portfolio theory. Firms need some way to measure market risk across disparate asset categories, but did not recognize hoe VaR might fill this need (Holton, 2002).

2.3 What is the Value at Risk ?

In its most general form, VaR measures the potential loss in value of risky asset or portfolio over a defined period for a given confidence interval (Butler 1999).

VaR is simply defined as expected minimum loss of a portfolio over sometime for some level of probability .VaR's popularity is based on its ability to aggregate several components of firm wide market risk into single number .What is the most I can lose on this

investment ?This is a question that almost every investor or anyone Who is considering investing in a risky asset ask himself at some point in time. Thus, if the VaR on an asset is 100$ million at a one-week , 95% confidence level, there is only a 5% chance that the value of asset will drop more than $100 million over any given week. In its adapted form, the measure is sometimes defined more narrowly as the possible loss in value form "normal market risk" As apposed to all risk, requiring that we draw distinctions between normal and abnormal risk as well as between market risk and non market risk .In fact, it is misleading to consider Value at Risk, or VaR as it is widely known, to be an alternative to risk adjusted value and probabilistic approaches (stern.nyu.edu)

After all, it borrows liberally from both. However, the wide use of VaR as a tool of risk assessment especially in financial service firms .

While VaR can be used by any entity to measure its risk exposure, it is used most often by commercial and investment banks to capture the potential loss in Value of their traded portfolios from adverse market movement over a specified period; this can then compared to their available capital and cash reserves to ensure that the losses can be covered without putting the firms at risk .

Today we can even speak about portfolio value at risk. The main objective of portfolio management is optimization of asset

allocation according to expected returns and risk class. It is rather difficult to compare various portfolio management strategies with different instrument types, so one needs an unique and universal risk measurement tool. Which that one of the modern and widely used risk measures, and which is help to manage in the first line market risk .

Customers would like to know about possible losses in their portfolio under certain suggestions. Nevertheless, the general problem for them static estimation without adoption to the surrounding financial and economic conditions .

That is why the building of dynamic strategy of the value at risk estimation are very effective (stern.nyu.edu).

2.4 The Name of "Value at risk "

The origins of the name "value-at-risk "are gloomy. Several names were used during the 1990's, including: "dollar-at-risk" (DaR), "Capital-at-Risk" (CaR), "Income-at-Risk" (IaR), "earning-at-risk" (EaR) and "Value-at-risk" (VaR).It seemed that users liked " -at-risk" moniker, but were un comfortable labeling exactly what was "at-risk". The "dollar" label of DaR was too provincial for use in many countries. The "Capital" label of CaR seemed to application-specific.

Some applications of VaR- such as VaR limits- were unrelated to capital. The "income" and "earning" labels of IaR and EaR had

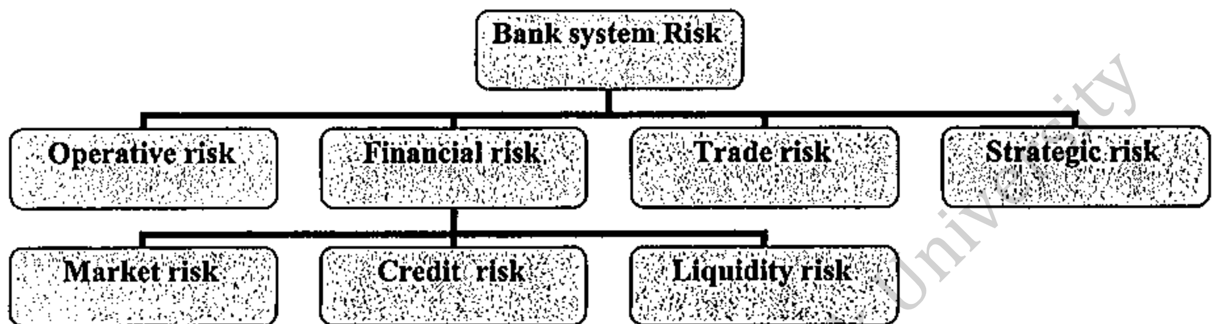
accounting connotations unrelated to market risk (Holton, 2002). The "fully hedged" in a bank with a fully matched funding can have two meaning we could either invest the bank's net equity in long bonds and generate stable interest earning; or we could invest in fed fund and keep the market Value constant. We decided to focus on Value and assume a target duration investors assigned to the bank's equity. Thus Value-at-risk was born. It seems likely that the "DaR" and "CaR" names also arose during the 1980's, since use of both was common by the early 1990's.Mark(1991) says that "DaR" appears in financial literature as early as June 1991-two years prior to the first known appearance of "VaR" in July 1993 by G30 report. Wilson (1992) says that "CaR" appears as early as September 1992 (Holton, 2002).

2.5 The Economic Importance of Value at Risk .

In banking system, risk is of various natures, which has from time to time not really received a complete explanation in the literature.

The difference of risk types can be described in the following way(Rogachev, 2002) :

Figure (2.1). Risks in the banking system



There are primarily four big risk arts: operative, financial, trade, and strategic risks in the banking system. Operative risk includes legal risks as well as technical risks, trade risk appears through the changing demand of bank instruments und competition issues. Under strategic risks the danger of whole or partial. Failure of the financial system is to be understood. We want to speak more about financial risk, which consists of credit risks, are to be led back on credit standing changes or the inability of the opposition to pay. The nature of liquidity risk comes from re-financing and possible delays in payment
(Rogachev, 2002).

But we are only interested in market risk for now. The most widely used tool to measure gear and control market risk is value at risk. The financial and economic world really needs this measure as it serves for a number of purposes. VaR build an

information report. It can be used to apprise scenario management of the risk run by trading and investment operations, this also means a clear communication of the financial risks to the shareholders of the corporations in non technical terms. Thus, VaR helps speed up the current trend towards better disclosure based on the Market-to-Market reporting. The Second point is resource allocation. Nowadays, especially in private banks and insurance companies VaR is used to set position limits for traders and to decide how to allocate limited capital resources. The advantages of VaR allow creation of common denominator with which to compare risky activities in divers markets. The total risk of the entrepreneur, firms, banks, and corporation can also be decomposed into "incremental". VaR to uncover positions contributing most to total risk. On the other hand, VaR can be used to adjust the performance of risk. Performance evaluation is essential in trading environment, were trader have a natural tendency to tack on extra risk. Risk capital charges based on VaR concept is being adopted as a risk measure by financial corporation and asset managers.

In the end the greatest benefit of VaR probably lies in the imposition of a structured methodology for critically thinking about risk. Through the process of computing their VaR. institution are forced to confront their exposure to financial risk and set up an independent risk management function supervising the front and the back offices. Indeed reasonable use of VaR may

have avoided many of the financial and economic disasters experienced over the past years. There is no doubt that value at risk is here to stay(Rogachev, 2002).

2.6 Computing VaR

VaR Framework (Application of VaR)

VaR summarized the worst possible loss due to a security breach over target horizon with a given level of confidence

More formally, VaR describes the quintile of the projected distribution of losses over a given period.

To illustrate the analytical capability of VaR, it could provide answer to the company with $ 100 million worth of asset lose, due to a security breach over a period say one month ?

In order to explain the VaR framework. We consider the case of an imaginary company : Shatha.com

Shatha.com is an online retailer that sell every thing from books to CDs. Its net present value is estimated at $ 100 million, Shatha.com has been in business for the last 5 years, and has always been subject to security breaches ranging from hackers to viruses. Last year during the holiday season it was subject to a rejection of service attack.

As a result of this rejection of the service attack, the company's web services crashed resulting in losses worth millions of dollars in the terms of lost sales and loss of reputation.

The company already has a security policy in place and had invested millions in security initiatives, however it was evident that these measure were not satisfactory and the company needed to reassess its information security risk . The information security manager decided to use the VaR framework of risk assessment to evaluate it is security preparedness. The VaR framework of information security risk assessment appears in four stages(Butler, 1999) :

1- identify threats

2- estimate likelihood

3- estimate VaR

4- risk mitigation

The first stage of risk assessment is identifying the threats or potential risks faced by a firm. And the risk is to identify the types of risks that each company faces, which would depend on the industry, the organization belong to. The assets and the type of customers among other things.

Shatha.com can perform a formal threat identification by conducting a survey of information security managers within or outside the firm or by employing consultants in the industry.

Second step is likelihood estimation, in this stage there are a number of surveys, which have reported the frequency of a security breach .

While such industry figures are useful to the organization, ultimately it will have to decide for itself the likelihood of the

risks it might face, especially given the understanding that most security breaches go unreported, especially in particular industries. Estimate of the frequency of unauthorized external access to an organization's system can be obtained from the access logs. Other estimates of likelihood of threats can be obtained from historical data. Information security officers within a firm are ideal candidates who can be interviewed to obtain threat likelihood figures. Based on industry survey, log data, historical data and interviews with key security personnel it would be possible for Shatha.com to estimate the probability of a distribution of threats. Possible risk scenarios can then be developed based on the probability distributions of individual risks. If the firm faces n risks then there are 2^n possible risk scenarios. With good judgment some of the possible risk scenarios can be eliminated.

Third stage is estimate VaR , after the different risks hae been identified, the likelihood of the these risks estimated and the possible risk scenarios developed, now the next step is to calculate the VaR of the firm. Information security managers at Shatha.com decided to estimate the VaR over a period of one month at 99% percentile confidence level. That mean the maximum amount in that dollar terms that Shatha.com can be lose over a period of one month as a result of security breach 99% of the time. For example, if the VaR in this case was calculated as $10 million, the worst loss would be less than $10 million, 99%

of the time over a period of one month. The VaR computation can be further simplified if the worst-case loss distribution can be said to belong to a parametric family, such as normal distribution.

There are steps that require to compute the VaR (Jorion 2001):

* Set Current Market value of company = $ 100 million
* calculate the variability of the risk factors as estimated from distribution of different risk scenarios. Assuming the simplistic case were all the risks are independent, the variability in the risk scenarios is the product of individual probability distribution
* Set a Time Horizon of 1 month .
* Set the confidence level to 99% percentile.
* report the worst-case loss to Shatha.com in each case of the risk scenario for the given time horizon. A probability distribution for the worst case loss can be estimated from this.
* for the estimated probability distribution for the worst-case loss, calculate the worst loss for the given confidence level. This value of the loss is the **VaR**.

The final step become after the VaR for Shatha.com has been calculated applying the procedure specified in this step would be to select security measures for risk mitigation. A company, which has a smaller VaR , would have to make a smaller investment on security measures than a company that has a larger VaR. The process of calculating the VaR for Shatha.com is the repeated

assuming that the new security measure are in place. The threats to Shatha.com and there corresponding likelihood are also going to change with the new security measures and this would affect the VaR calculations . after various iterations the right tradeoff between an acceptable VaR and cost of providing security can be achieved

(Winner,Z.1997).

2.7 Method for VaR Measurement

There are several basic approaches that are used to compute value at Risk, though there are numerous variations within each approaches. Typically this is not a very precise type of calculation. There is a need to rely on may different parameters, and each one has a small error. The measure can be computed analytically by making assumption about return distribution for marker risks, it can also be estimated bu running hypothetical portfolios theory historical data or from Monte Carlo simulation (Jorion , P. 2001) .

In this section, we describe and compare the approaches. We will discuss the two basic types of methods: parametric and non-parametric.

Parametric model include the variance-covariance approach and some analytical method as (Winner, Z. 1997) assumed. But non-parametric model include historical simulation and Monte Carlo approaches .

To compute VaR we need to

* Select of basic parameters (time horizon, confidence level, time of a measurement)

* Selection a relative market risk factors.

* Risk maping

* VaR calculation

The following are the different types of techniques to calculate VaR.

2.7.1 . Historical simulation :

This is probably the simplest non-parametric way of estimating the Value at Risk for many portfolios. Because there are no assumption of a complex structure of the markets. This approach is intuitively simple to understand. Risk managers simply keep a historical recorded for daily profit and losses within the portfolio and then calculate the 5^{th} percentile for 95 percent or 1 percent for 99 percent VaR.

As well as being simple, the historical approach is realistic. The same volatilities and correlation are not actual figures, but estimates based on average over a specified time.

In extreme simulations, these averages may not hold, so the Risk metrics approach may not given a realistic result (Jorion, p. 1997).

The historical method is based on the actual results and if, during the historical period, major market event happened, these will be picked up accurately by the historical system.

A second advantage of the historical method is that it dose not require "mapping" when constructing a weighting matrix for risk metrics, the instrument may not neatly fit into the model devised by JP Morgan.

The main weakness of historical approaches is that it is unsuitable if the weightings of the portfolio change, that is to say if the portfolio composition changes overtime. To overcome this, the historical approach can be augmented by the historical simulation approach. Here we use the current portfolio composition but use historical market data.

Butler (1999) said that if a current portfolio consists of 70 percent of asset one and 30 percent of asset two, then we would obtain the share price of asset one and two for, say, the past 1000 days, and for each day calculate the value of the portfolio, keeping the current weightings of 30 percent and 70 percent constant .

2.7.2 Variance-Covariance Method:

This is a parametric method, based on the assumption that the returns normally distributed.

Historical data is used to measure the major parameters: means, standard deviation, correlations.

The overall distribution of the market parameters is constructed from this data. This method involves using " Published" information on volatility and correlation and then constructing an initial weighting matrix. The process is probably the most popular because it is simple to construct.

Using the risk mapping technique, the distribution of the profit and losses over the time horizon (typically one day) can be found.

Butler (1999) said that a bank wishing to calculate its VaR must simply construct a weighting matrix, and then obtain the volatility and correlation data from JP Morgan, which publishes and regularly updates it is matrices on the internet. There are a few limitation, however JP Morgan's approaches is not suitable for options. Also, there is the assumption that the relation between asset "correlation coefficient " are stable. Thus, of course, may not be true particularly when there is a major event like a stock market crash. Additionally, JP Morgan's approaches places an over reliance on the normal distribution curve. The strong side of this approaches is that flexible, simple and widely used. It also enables the addition of specific scenarios and enables the analysis of the sensitivity of the results with respect to the parameters. How ever, it relies heavily on the important assumption that all of the major market parameters are normally distributed .

Therefor when a significant portion of the portfolios is not linear with option. This method can not be used directly.

The major market information used in this approach is the variance –covariance matrix (and means).

All of these parameters are typically extracted from historical data. A naive formulation covariance based on historical observations has two major drawbacks as Alexander, Leigh 1997 describe in details .

First, an important property of the variance-covariance matrix is that it must be positive definite, however, because of the very high degree of correlation. Even a smaller error in the data can easily lead to loss of this property. The standard procedure applied in this case is to decompose the matrix either to eigervalues or to singular values and to replace small negative values be zeros .(Jorion, P. 2001)

A second difficulty is related to the fixed rolling time window, the problem here is exactly the same as the one we have mentioned when discussing the historical simulation approach.

The solution can be found with an appropriate weighting scheme. more weight is given to the current past and less weight to the older events.

2.7.3 Monte Carlo simulation method:

This is another non-parametric method is passed on the assumption that we have some information about joint distribution of the market changes. This procedure involves

asking a computer to generate a series of share price using "a random walk " approach. The procedure can be quite complex and, although in terms of precision it is the most effective it suffers from the fact with it is time consuming and, like historical simulation, demanding of computer resources. This method has several advantages : first, it dose not assume a specific model and can be easily adjusted to economic factors. The results can be improved by taking a larger number of simulation scenarios. Options and other nonlinear instruments can be easily include in a portfolio. In addition; one track path-dependence because the whole market process is simulation rather than the final result alone (Wiener, 1997).

Monte Carlo analysis is by far the most powerfull method to calculate VaR. It is flexible enough to incorporate time variation in volatility. MC simulation also can incorporated the passage of time, which will create structural changes in the portfolio. One important disadvantages is very slow convergence. Any Monte Carlo type simulation converges to the true value as $1/\sqrt{N}$, where N is the total number of simulated trajectories. An additional problem with Monte Carlo simulations that one needs to know the joint distribution of many market parameters. Where there are more than 3-4 important parameters it is not easy to clean all the data and to build this multidimensional distribution.

An advantages of the Monte Carlo simulation is that it allows the use of the preliminary results of all of the methods mentioned above.

Overall, this method is probably the most comprehensive approach to measure market risk if modeling is done correctly.

Finally, the historical simulation can give a first approximation to the distribution function. The Variance-covariance shows which connection between variable are important and which can be neglected.

In addition, One can easily performed stress testing on the Monte Carlo simulation or perform a more detailed analysis of a specific set of scenarios, including dynamic strategies, such as prepayment or pintail recovers (wiener,Z. 1997).

2.7.4 Comparing Approaches

Each of the three approaches to estimate VaR has advantages and comes with baggage. The Variance-covariance approach. With its delta normal and delta gamma variations, requires us to make strong assumptions about the return distribution of a standardized assets , but is simple to compute . once these assumption have been made. The historical simulation approach requires no assumptions about the nature of return distribution but implicitly assumes that the data used in the simulations is a representative sample of the risks looking forward.

The Monte Carlo simulation approach allows for the most flexibility in terms of choosing distribution for returns and bringing in subjective judgments and external data, but is the most demanding from a computational stand point. Since the end product of all three approaches is the Value at Risk. It is worth asking two question :

1- how different are the estimates of the VaR that emerge from the three approaches?

2- if they are different, which approach yields the most reliable estimate of VaR ?

To answer the first question, we have to recognize that the answer we obtain with all three is a function of the inputs. For instance, the historical simulation and variance-covariance methods will yield the same VaR of the historical returns data is normally distributed and is used to estimate the variance-covariance matrix (stern.nyu.edu) .

Similarly, the variance-covariance approach and Monte Carlo simulations will yield roughly the same value if all of the input in the latter are assumed to be normally distributed with constant means and variance. As the assumption diverge, so will be the answer.

Finally, the historical Monte Carlo simulation approaches will converge if the distributions are entirely based upon historical data.

As for the second, the answer seems to depend both upon what risks are being assessed and how the competing approaches are used.

There are variants that have developed within each approach, aimed at improving performance.

Many of the comparisons across approaches are skewed by the fact that researching doing the comparison, are testing variants of an approach that they have developed against alternatives.

The question of which VaR approach is best answer by looking at the task at hand?

If you are assessing the VaR for portfolios, that do not include options. Over very short time periods like a day or week; the variance covariance approach dose a reasonably good job. If the Value at risk is being computed for a risk source that is stable and where there is subtational historical data like commodity prices, for insurance, historical simulation provides good estimates. In the most general case of computing VaR for non-linear portfolios, over larger time periods, where the historical data is volatile and non-stationary and normality assumption do best (www.stern.nyu.edu).

2.7.5 Non-stationary correlations

Measures of Value at Risk are conditioned on explicit estimates of correlations across risk sources like the variance-covariance

and Monte Carlo simulation. These correlation estimates are usually based upon historical data and are extremely volatile.

One measure of how much they move can be obtained by tracking the correlations between widely following asset classes over time.

One indicator that value at risk is subject to judgment comes from the range of values that analysts often given to the measure, when looking at the same risk for the same entity.

Beder(1995) said that the different assumption about return distributions and different historical time period can yield very different value at risk.

But Marshall and Michael (1997) show that the different measures of value at risk can be derived for a portfolio even when they start with the same underlying data and methodology.

Berkowitz and O'Brien (2002) studied the value at risk measures used at a large bank holding companies to measure risk in their trading portfolios concluded that they were much too conservatively set and were slow to react to changing circumstances; in fact simple time series models outperformed sophisticated VaR models in predictions.

In fact, the study conclude the computed value at risk was more a precautionary number for capital at risk than the measure of portfolio risk.

2.7.6 Models of VaR

There are variety of models that be used to estimate VaR. for instance, some risk management systems allow user-defined simulations, or used scenarios-based models to calculate VaR these techniques, and the circumstances in which they, and the tools that implement them, are most appropriate, are described elsewhere, e.g., Leong (1996). However, the most widely used technique to calculate VaR utilizes historical covariance between different risk factors to assess the effect of stocks on a portfolio whose positions can be mapped to these risk factor, Beckstrom (1995). One such parametric models is J.P. Morgan's RiskMetrics™. And given its widespread use. It is timely ask to what extent this particular model provides a lingua franca for risk management. Update daily across the internet, RiskMetrics™ correlations and volatilities allow user to assess their aggregate financial market risks (in terms of VaR) over a given time periods consistently across different asset classes. And, in an effort to make the use of the data sets more transparent, J.P. Morgan have also made public the details model by which these volatilities and correlations are calculated and in which manner they should used (Guldimann 1995). While this model has been criticized as making overly simplistic assumptions, we note that models are invariably compromises between usability on the one hand and accuracy on the other; RiskMetrics™ focus on providing a relatively simple and transparent tool (Longerstaey and zangari 1995).

Despite RiskMetrics™, popularity, the question remains whether this or any other model such as Bankers Trust's RAROC 2020, and CS First Boston's PrimeRisk. From perspective of this research however, RiskMetrics has the important advantage in that it is widely used, formally described and publicly available. Can constitute a standard independenc of the details of the model's implementation and use. This is no new notion; it was till Guldimann, one of the architects of RiskMetrics™, who observed that "risk measurement and management continues to be as much a craft as it is a science" and that "no amount of sophisticated analytics will replace experience and professional judgment in the managing risk". The formal model is not, and may never be a complete description of the prices implementation of the model is every circumstantive, because of the potentially infinite variety of instruments and the large number of markets, whose institutional and statistical attributes are varying over time. This incompleteness of the model implies that decisions are left to the systems developer who chooses to implement the model and the systems user who interprets the inputs and the outputs. It is these decisions that suspect lead to variance in the outputs produced by the different systems, even though they utilize the same formal model. It follows, that unlike the earlier studies of Beder and Hendricks which focused on variance caused by a diversity of models(Marshall,1996) .

2.8 Limitations of VaR

While VaR has acquired a strong following in the Risk Management community, there is reason to be skeptical of both its accuracy as a risk management tool and it is used in decision making. There are many dimensions on which researcher have taken issue with VaR and we will categorize the criticism into these dimensions (stern .nyu.edu).

There is no precise measure of the Value at Risk, and each measure comes with its own limitations. The end-result is that the value at risk that we compute for an asset portfolio or firms can be wrong, and sometimes the error can be large enough to make VaR as a misleading measure of risk exposure. The reasons for the errors can include the following :

A- Return Distribution : Every VaR measure makes assumption about return distribution, which, if violated, result in incorrect estimates of the Value at Risk. With delta normal estimates of VaR, we are assuming that the multivariate return distribution is the normal distribution .since the VaR is based entirely on the standard deviation in returns. With Monte Carlo simulation, we get more freedom to specify different types of return distribution, but we can still be wrong when we make these judgments.

Finally, the historical simulations, we are assuming that historical return distribution (based upon past data) is a representative of the distribution of the return looking forward.

There is a substantial evidence that returns are not normally distributed and not only are outliers more common in reality but that they are much larger than expected, given the normal distribution.

Firms that use VaR to measure their risk exposure, would be under prepared for larger and potentially catastrophic event that are extremely unlikely in the normal distribution but seem to occur regular intervals in the real world (stern .nyu.edu) .

b- History may not be a good predictor All measure of the VaR use historical data to some degree or the other.In the variance-covariance method, historical data is used to compute the variance-covariance matrix that is the basis for the computation of VaR. In historical simulation, the VaR is entirely based up on the historical data with the likelihood of value losses computed from the time series of returns.

In Monte Carlo simulations, the distribution don't have to be based upon historical data but it is difficult to see how else they can be derived. In short, any value at risk measure will be a function of the time period over which the historical data is collected. If that time period was a relatively stable One, the computed VaR will allow numbers and will understate the risk looking forward. Conversely, if the time period examined was volatile, the value at risk will be see too high (stern.nyu.edu) .

Chapter Three

The Literature Review

3.1 Introduction

In this chapter, we will discuss the previous studies. All these researches were originally English. unfortunately, we found no Arabic studies in this field. These researches take the Value at Risk (VaR) in it's consideration and developed it in several ways, and related it to three main topics: the first one is about VaR and rates of return, while the second one discusses the VaR management, finally hedging reviewed with the VaR literature.

3.2 The Literature

3.2.1 VaR and the Rates of Return

Bali and Cakici (2004) tested whether the maximum likely loss measured by VaR can explain the cross sectional differences in expected returns. They used the time series approach to test the empirical performance of VaR at the portfolio level. They used Center of Research in Security Prices (CRSP) data for all non-financial companies listed in the NYSE, AMEX and Nasdaq for the period from January 1958 through December 2001.

For December of each year, starting with December 1962, they computed the variables size, beta, and VaR for each company in

the sample. They measured company size by the natural logarithm of the market value of equity (a stock's price times shares outstanding), for each stock as of the sample selection data. To find beta, they follow Fama and French (1992). They stored all NYSE stocks by size, and estimated pre-ranking betas for two to five years (as available) of monthly returns ending in December of each year. After assigning each stock in the sample to one of 10 size decline and one of 10 pre-ranking beta declines, they computed the equally weighted monthly returns of the resulting 100 portfolios for the next 12 month.

To estimate VaR, they used three confidence level (99 percent, 95 percent and 90 percent) to check the robustness of VaR as an explanatory variable for expected stock returns, the time horizon was one month.

To check the sensitivity of their finding to alternative investment horizons, they used the time series averages of the slop coefficients from monthly and annual cross-sectional regressions and found that results for the annual regression were quite similar to their finding for the month-by-month Fama-macbeth regression: size, liquidity, and VaR can capture the cross-sectional differences in expected returns, at the stock level. They compared the relative performance of size, beta, and VaR in explaining the cross-sectional variation in portfolio returns. The result indicate that all the risk factor considered in this study can capture the cross sectional differences in portfolio returns. The

strong positive relationship between stock (or portfolio) returns and VaR is robust for different investment horizon and loss probability level .

The results indicate that VaR can capture substantial time-series variation in stock returns and can provide additional explanatory power even after the characteristic of the market return , size book-to-market ratio and liquidity are controlled for. The results also imply that the relationship between VaR and expected stock returns is not an effect of the several in long-term returns, liquidity and volatility.

Berkowits and O'Brien(2001) provided descriptive statistics on trading revenues from such activities and on the associated VaR forecasts internally estimated by banks. They provides the direct evidence on the performance of value at risk models for six large commercial bank in USA. They evaluate the performance of banks' trading risk models by examining statistical accuracy for the VaR forecasting.

They analyze the distribution of historical trading P&L (profit and losses) and daily performance of VaR estimated for large U.S. banks which include the largest U.S. bank derivative dealers and all are in the top 10 in terms of national amount outstanding as of year-end 1999.

They evaluate the VaR forecasts in several ways: First, null hypothesis of 99 present coverage rate is tested. After they

defined the data and describes the distribution of the daily P&L and bank's VaRs, they present the econometric methodology used to evaluate the performance of models against the observed P&L. Then they considered some current practices and difficulties in constructing structural model of large complex trading portfolio which might help to explain the performance of the estimated bank's VaR.

The results show that VaR forecasts for six large commercial banks have exceeded the nominal coverage levels over the two years and, for some banks, VaRs were substantially removed from the lower range of trading P&L. While such conservative estimates imply higher level of capital coverage for trading risk. They conclude that the reported VaRs are less useful as a measure of actual portfolio risk. Also, they found that despite the detail information employed in the bank models, their VaR forecasts did not out-performed forecasts based simply on an ARMA plus GRACH model of the banks P&L. Comparing these reduced-form forecasts, the bank VaRs did not adequately reflect changing P&L volatility. These may reflect substantial computational difficulties in constructing large scale structural models for large complex portfolios.

Danielsson and Vries (2000) study the role of an option that lower the downside risk of the portfolio. They developed techniques to evaluate and forecast the risk of uncommon events

that moved at a rapid rate. These methods fall in two main classes: parametric prediction of conditional volatilities and non-parametric prediction of unconditional volatilities such as technique based on historical simulation or stress testing methods. They combine non-parametric estimation of the tails of the return theory. Then they evaluate various methods for VaR analysis and compare the historical method with Thair tail distribution estimator using a portfolio of stocks.

First, they construct a number of random portfolio over several time periods, compare the results of one step ahead VaR prediction. Second, they investigate multi-day VaR analysis. Third, they study the implications of adding an index capital. Finally, they discuss the practical implementations of these methods of real portfolio management, with special emphasis on the ease of implementation and computational issues.

They show that conditional parametric method such as GARCH with normal innovation, as implemented in risk metrics, under predict the VaR of a sample of U.S. stock return at the 1 % risk level or below. Historical Simulation performs better in predicting the VaR, but suffers from the high variance and discrete sampling for out in the tails. Moreover, historical simulation is unable to address losses, which are outside the sample the performance of the extreme value. Estimator method performe better than both risk metric and historical simulation for out in the tails. They also

observed that the present incentive are detrimental to implementing these improved VaR technique.

Chen and Tang (2005) consider nonparametric estimation of VaR and associated standard error estimation for dependant financial returns. Theoretical properties of the Kernel VaR estimator are investigated in the context of dependence. The presence of dependence affects the variance of the VaR estimates and has to be taken into consideration in order to obtain adequate assessment of their variation. The article shows that extreme quantiles can be estimated effectively by the nonparametric Kernel method. Another concern with the nonparametric approach is that the VaR estimates are volatile whenever a larg loss enters the sample. They take the sample VaR estimator at level 1-p as an example. As it is the pth sample quantile, it is unchanged unless there are more than [pn] big new losses entering the return series. If $n > 100$, a single big loss does not alter the 99% sample VaR estimate, and the robustness increases when n becomes larger. In contrast, both the parametric and the Extreme Value Distribution EVD-based VaR estimates would be altered by the single big loss. They found that the performance of VaR estimators and the proposed standard error estimation procedure are evaluated by theoretical investigation, simulation of commonly used models for financial returns, and empirical studies on real financial return series.

3.2.2 VaR and Risk Management

Glasserman, Heidelbr and Shahabuddin (2002) develop methods for calculating portfolio loss probabilities when the underling risk factors are heavy-tailed, and without assuming linearity of the portfolio value with respect to changes in risk. They focus on multivariate t distribution and some generalization of this distribution. They follow Anderson (1984) and Tony (1990) in working with a particular class of multivariate distribution having t marginal for which the joint distribution is characterized by symmetric, positive definite matrix Σ, along with the degrees of freedom. The researchers developed two methods for estimating portfolio loss probabilities in the presence of heavy-tailed risk factors and this method is efficient method for computing portfolio VaR when the underlying risk factor have a heavy tail distribution. They developed two method for VaR calculation that exploit quadratic approximation to the portfolio loss: the first method uses transform inversion based on quadratic approximation to portfolio value. This method is fast, but a quadratic approximation to portfolio value is not always sufficiently accurate to produce reliable VaR estimates. The second method uses the first method to develop Monte Carlo sampling produces that can greatly reduce variance compared with ordinary Monte Carlo. The method combines importance sampling and stratified sampling in the spirit of Glasserman, Heidelberger and Shahabuddin (1999a, a199b and 2000). Which

assumed a multivariate normal distribution. They applied an exponential change of measure.

The numerical results on a variety of test portfolio indicate that large variance reduction are typically obtain. Both method developed in the study overcome difficulties associated with VaR calculation with heavy-tailed risk factors. The Monte Carlo method also extends to the problem of estimating the conditional excess, sometimes known as the conditional VaR.

Basak and Shapiro (2001) undertake a comprehensive analysis of the VaR-based risk management (VaR-RM), while rationing the standard financial economics paradigms of rational expectations, utility maximization, and market clearing. They study the implications of the VaR-RM for optimal portfolio policies horizon, wealth choice and equilibrium prices.

They focus on portfolio choice within the familiar (continues time) complete market sitting, where the novel feature of the analysis is the assumption that against many limits the risks while maximizing expected utility.

They assume that a risk management agent is constrained to maintain VaR horizon wealth at pre-specified level. They show that under general security price uncertainty and general state independent performance, an agent with VaR capped, optimaly chooses to insure against intermediate-loss states, while incurring losses in the worst states of the world.

They exhibit a problematic feature of the derived optimal behavior in that although the probability of a loss is fixed when large loss occurred it is larger than when not engaging in the VaR-RM. But under Constant Relative Risk Aversion (CRRA) performance and lognormal state prices, they show that the risk manager's dynamic portfolio choice to deviate considerably from that of portfolio insurer and benchmark agent.

They propose and evaluate an alternative form of risk management that maintains Limited Expected Losses [LEL]. When loss occur, they found that expected losses under the VaR-RM may be serial times larger than those under LEL-RM. They move from the partial equilibrium analysis to a general equilibriums setting to investigate the impact of extensive usage of the VaR-RM. They found that when the economy contains VaR-RM, the stock market volatility (and risk premiums) increases relative to the bench and decreases in the up word market .

Wirch (1996) considers the properties of a coherent risk measure, outlined by Artzner *et al.* (1996), and relate these requirement to evaluate economic risk.

The researcher assumed that the user has a reliable model for the joint distribution of risk factor, and can model their portfolio to adequately reflect the uncertainty about the risk parameters. It is. she uses a percentile VaR under a normal assumption to describe

a loss distribution with normal type tails seems reasonable. She tried to identify the Mean Excess Loss (MEL) function of a normal distribution with the same mean and variance or the same mean and 95th percentile. Comparing further with the MEL (mean excess loss) function of the log-normal or par to distribution could help to identify how heavy the tails of the distribution are, and whether using VaR as a risk measure severally underestimate the risk. She shows how the usual method of calculating VaR does not adhere to the coherency requirements and discusses the implications of such a result. As well, she discuss the use of the MEL function and shows how this can be used to help identify problems relating to VaR.

Benninga and Wiener (1998) demonstrate a very basic approach to risk measurement techniques using mathmatica. They describe how to implement VaR, They used the mathematica to demonstrate the basic method for calculating VaR hypothetical portfolio of stock and foreign bond. They considered that the log-normal distribution is more reasonable distribution for many asset prices (which can not become negative) than the normal distribution.

And they tried to solve the problems (a three asset problems the Importance of variance-covariance matrix. And for solve there problems. They use empirical data to calculate VaR, risk mapping, historical simulation variance-covariance approach and

Monte Carlo approach. The result was this discussion The historical simulation method is useful when the amount of data is not vary large but the researchers do not have enough information about the profit and loss distribution. It is usually very time consuming , but it main advantages is that it catches all recent market crashes this feature is very important for risk measurement. The variance-covariance method is the fastest. However, it relies heavily on several assumption about the distribution of market data and linear approximation of the portfolio. It is probably the best method for quick estimates of VaR. however one should be very careful when using this method for a non-linear portfolio. Especially in the case of high convexity in options or bonds. The Monte Carlo simulation method is very slow, but it is probably the most powerful method. It is flexible enough to in corporate private information together with historical observation. The result found that the result of all three method are similar.

Dimitrios and Guerard (2004) examine the forecasting performance of a number of parametric and non parametric models. based on training-validation sample approach and the use of rolling short-term forecasts to compute root mean-squared errors. They also compare the performance of these parametric models with nonparametric forecasts obtained from univariate and bivarite non-parametric models. About the data they used six

different dataset in their forecasting performance analysis. The first two are benchmark datasets and are include to indicate the advantages of the appropriate Transfer Function (TF) specification. The data sets include quarterly series with monetary and stock market data, mergers, and stock price data, employment/unemployment and minimum wage data and monthly series of unemployment and leading indicators data. They found that the performance of these models better than the naïve, no-change model. And the use of bivariate models (like VAR and transfer functions) provides additional mean-squared error reduction. In many case the nonparametric models forecast as well or better than the parametric models. There analysis suggest that (a) non parametric models are attractive complement to parametric univariate models and, (b) simple VaR models should be considered before attempting to fit transfer function models. They suggest that the simplest model are not always the most appropriate for forecasting, especially when additional information is available.

3.2.3 VaR and Hedging

Rockafallar and Urgasev (2000) introduce a new approach to optimize or hedge a portfolio of financial institution so as to reduce the risk of high losses. They demonstrate with two examples that provides valid results.

These example have relatively low dimensions and are offered here for illustrative purposes. They considered value-at-risk (VaR) has a role in the approach that they introduced, they focuses on minimizing conditional value-at-risk (CVaR) rather than minimizing (VaR). The technique that used for portfolio optimization with calculates VaR and optimizes CVaR simultaneously with respect to a specified probability level β, the β-VaR of the portfolio is the lowest amount α. Three value of β are commonly considered : 0.90 , 0.95 , and 0.99 .

This technique is suitable for use by investment companies, brokerage firms, mutual funds, and any business that evaluate risk. It can be combined with analytical or scenario based methods to optimizing portfolios with a large numbers of instruments. The calculations come down to linear programming or non smooth programming. And they showed that CVaR can be efficiently minimized using linear programming and non smooth optimization techniques. This method minimize only CVaR, the numerical experiments indicate that it also lowers VaR because CVaR>= VaR.

Numerical experiment have been conducted of larger problems but those results will be presented elsewhere in a comparison of numerical aspects of various linear programming techniques for portfolio optimization .

3.3 What distinguishes this Study from the previous studies

The differentiating between this study and the literatures review, that is the literatures review focused on the theoretical side for deriving VaR and classifying it an studying it as a statistical model.

But this study considering the VaR is a model and use this model as a risk management and appling it in ASE, to test the relationship between it and Index return .

This study is the first one in Jordanian universities take the VaR and study it ,use it in ASE.

Chapter Four
Institutional Background of
Amman Stock Exchange Market

4.1 Introduction

Stock market is a financial intermediary that definitely assist lenders and borrows of fund to meet conveniently and with less cost. The World Bank considers any stock market in developing country as an "emerging market". Emerging market (EMs) is characterized by low liquidity, thin trading, unreliable information, and less informed investors trying to enhance portfolio diversification.

Investors have been attracted by the perception of high expected returns offered by emerging market stocks.

Harvey (1995) showed that the correlation among equities in emerging markets are very low provided further evidence of diversification potential of EMs investing. Also he showed that there were significant differences among EMs in their price-earning ratios and book-to-market value ratio .

This chapter will present a background and overview about the Jordanian economy and Amman financial market development.

4.2 Background on the Jordanian Capital Market

In early thirties, the Jordanian public already subscribed to and traded in shares; the Arab Bank was the first public shareholding company to be established in 1930, followed by Jordan Tobacco and Cigarettes in 1931, Jordan Electric power in 1938, and Jordan Cement Factories in 1951. The first corporation bonds were issued in early sixties (www.ase.com.jo).

Long before the establishment of the Jordanian capital market in late 1970's, shares of the some publicly held companies were traded over-the- counter in an irregular market. Corporate bond were also begin traded as early as 1970's when the main development in the Jordanian capital market occurred. As a result, an unorganized securities market has emerged in the form of non-specialized offices. This promoted the government to contemplate the idea of sitting up a market to regulate issuance of and dealing in securities, in a manner what would ensure safe, speedy and easy trading, and protect small investors, through a mechanism that would defined a fair price based on supply and demand. Successive economic plans called for the establishment of such a market, and various parties started to prepare, with government support, of setting up an organized securities market (www.ase.com.jo). Public shareholding companies were setting up their shares for trading , long before setting up the Jordanian financial market.. In 1975 and 1976, the Central Bank conducted

intensive studies, in cooperation with the World bank's International Finance Corporation for then step. Such a market was perceived as a creator of and caterer for much needed opportunities for economic growth which would stimulate and spurt economic activity. These joint efforts bore their fruit, and a temporary law No. 31 of the year 1976 was promulgate, and what was known as Amman Financial Market was consequently established. A Cabinet Resolution of March 16, 1977 set up an AFM Administration committee, with immediately went into action; and operation on AFM started on the 1st of January, 1978 (www.ase.com.jo) .

4.3 Major Developments of the Jordanian Capital Market

During the 1980's and early 1990's the market grew in the unbalanced way, and by the mid of the 1990's it was necessary that a further restructure of the market was required to increase its size and liquidity.

The enactment of the Temporary Securities Law, No. 23 of the year 1997, was a landmark; indeed, it was a qualitative leap and a turning point of the Jordanian capital market. Its aim was to restructure and regulate the Jordanian capital market. And to complete its infrastructure in consistence with international standards, in order to secure transparency and safe trading in securities. The central feature of this restructuring effort was the

separation of the supervisory and legislative role from the executive role of the capital market. The latter was left to the private sector, whereby Amman Stock Exchange / Securities Market (ASE) and the Securities Depository Center (SDC) played the executive role, and the supervisory and legislative role was entrusted to Jordan Securities Commission (JSC). The Law provided for sitting up three new institutions to replace AFM, namely (www.ase.com.jo) :

1. Amman Stock Exchange (ASE).
2. Jordan securities commission (JSC).
3. securities Depository Center (SDC).

4.3.1 Amman Stock Exchange (ASE)

The ASE was established in March 1999 as a non-profit, private institution with administrative and financial autonomy. It is authorized to function as an exchange of trading financial securities. The exchange is governed by seven number board of directors. A chief executive officer oversees day-to-day responsibilities and reports to the board. The ASE membership is comprised of Jordan's 65 brokerage firms. The ASE is committed to the principle of fairness, transparency, efficiency, and liquidity. The exchange seeks to provide a strong and secure environment for its listed securities while protecting and guaranteeing the rights of its investors. To provide this transparent and efficient market, the ASE has implemented internationally recognized

directives regarding market divisions and listing criteria (www.ase.com.jo).

To comply with international standards and best practices, the ASE works closely with the Jordan securities Commission JSC on surveillance matters and maintains strong relationship with the other exchanges, associations, and international organizations. The exchange is an active member in the union of Arab Stock Exchanges, federation of Euro-Asian Stock Exchanges (FEAS), a affiliate member in the world Federation of Exchange (WFE), and an affiliate member in the International Organization for Securities Commission (IOSCO). The ASE is charged with: providing enterprises with a means of raising capital by listing on the exchange, encouraging an active market in the listed securities based on the effective facilities and equipment for trading the recoding of the trades and publication of prices, monitoring and regulating market trading, coordination with the JSC as necessary, to ensure compliance with the law, a fair market and investor protection, setting out and enforcing a professional code of ethics among its member directors and staff, Ensuring the provision of timely and accurate information of issuers to market and disseminating market information to the public (www.ase.com.jo)

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4.3.2 Jordan Security Commission (JSC)

It aims at supervising the issuance of and dealing in securities, regulating and monitoring the activities and operations of those organs falling under its supervision. It also aims at regulating and supervising the disclosure of information related to securities, issuers, insiders trading and major shareholders.

JSC has financial and administrative autonomy, and is directly attached to the prime Minister. Which would enhance its future role, and would enable it to effectively assume it supervisory role over the capital market. It has a Board of Commission, composed of five full-time members, which is entrusted with the following functions: drawing up draft laws and regulations on securities; approving the by-laws and regulations of the SDC and ASE; granting licenses issued under the Law; setting limits for commission of financial services companies and members of the SDC and adopting accounting and auditing standers for the organs failing under its supervision as well as standards for there qualified auditors (www.ase.com.jo) .

4.3.3 Security Depository Center (SDC)

The Securities Depository Center (SDC) of Jordan is a public utility institution established in the kingdom by virtue of the Securities Law No (23) of 1997. The Securities law of 1997 separated the function of the Amman financial market (AFM) and created the Jordan Securities Commission (JSC), the Amman Stock Exchange (ASE) and the securities Depository Center (SDC). The SDC commenced operation in may 1999, as a privet non-profit institution with administrative and financial independence, run by a seven member board of directors. SDC is the only entity in Jordan that is legally empowered to oversee the following responsibilities:

a) The SDC is one of the major institutions in Jordan's Capital Market as it holds the ownership register of all issued shares. It has been assigned, in cooperation with the JSC and the ASE, the task of brining about a qualitative leap in market efficiency.
b) The SDC has been recognized by the association on National Numbering Agencies (ANNA) and the JSC as the sole numbering agency in Jordan for the assignment of International Security Identification Numbers (ISIN). All share books at the SDC are numbered according to the ISIN numbering scheme.

c) The Securities Law No. (76) of 2002 specified the responsibilities of the SDC to include the registration, safekeeping, transfer of ownership, deposit and clearing and settlement of securities. In order for the SDC to perform its operations, it was necessary to establish a central registry and depository of authenticated shareholders along with a central settlement process. This ensures that the registers of all public shareholding companies are held and maintained at SDC in electronic form (sdc.com.jo , March 2008) .

4.4 The Capital Market :

The capital market is the market for financial securities, where companies and governments can raise long-term funds. It is a market in which money is lent. For periods longer than a year. The capital markets consist of the primary market and the secondary market (www.ase.com.jo)

1. The Primary Market :

Features of the primary market are (www.ase.com.jo) :

- This is the market for newly issued time capital. The primary market is the market where the securities are sold for the first time. Therefore it is also called New Issue Market (NIM).
- In a primary issues, the securities are issued by the company directly to investors.

- The company receives the money and issues new security certifications to the investors.
- Primary issues are used by companies for the purpose of setting up new business or for expanding or modernizing the existing business.
- The primary market performs the crucial function of facilitating capital formation in the economy.
- The financial assets sold can only be redeemed by the original holder.

Most shares issued before 1997 had a nominal value of JD 1, with the exception of a few such as Arab Bank (nominal value JD 10), and the Jordan Petroleum Refinery (JD5). Before 1997, the price of new share offering by established company was determined by a committee of Ministry of financial and Trade in co-operation with ASE, and priced based on a purely subjective weight between the book value of the share and its market value. However, according to the Securities Law 1997, the price of new issues should be determined by the General Assembly and the Board of Directors using a market-based method.

The bond market is still in its early stages of development. Three different types of bonds are issued: Corporate bonds, development bonds and treasury bonds (www.ase.com.jo) .

2. The Secondary Market:

The secondary market is a financial market where previously issued securities and financial instruments such as stocks, bonds, option and futures are bought and sold. Secondary market in ASE is subdivided into six major markets; first market, second market, third market, bonds market, mutual funds market and transactions off the trading floor, explained as follows (www.ase.com.jo) :

a. The First Market

First Market is a part of the secondary market in which trading in securities takes place subject to listing rules according to Directives for Listing Securities on ASE.

b. The Second Market

It is that part of the secondary market through which trading takes place in securities, governed by special listing rules according to Directives for Listing Securities on ASE. According to Article (3) of the Directives for Listing Securities on ASE Issued by the virtue of the provisions of article (26, Para: A) of the Securities Law No. 23 of 1997, companies that apply for a listing of their sharers on the second market must fulfill the following conditions:

1- The net shareholders equity must not be less than 50% of the paid-in capital.

2- A full year must have elapsed since the company was granted the right to start its business.

c. The Third Market

It is that part of the Secondary Market through which trading takes place in securities that is not listed on ASE. Upon obtaining the right to the company to start its business, the company can file an application with the ASE to trade its shares through this market. The company provides the ASE with the available financial statement and all information requested by the ASE (Article 20) of the Directives for Listing Securities on ASE). The company shall not be listed on the ASE until it fulfills the listing requirements on the second market and submits an application for listing to ASE (www.ase.com.jo) .

d. The Bond Market

Also known as the debt, credit, or fixed income market. It is a financial market where participation buy and sell debt securities, usually in the from of bonds.

e. Mutual Funds Market

A mutual fund is a professionally managed type of collective investment schema that pools money from many investor and invests it in stocks, bonds, short-term money market instruments, and/or other securities, and then these funds are traded in this

market. Trading on this market in ASE is considered to be thin, since through the years, trading on mutual funds market represent a small proportion of the total trading volumes of the secondary markets (Amman stock Exchange Annual Reports) .

f. Transactions of the Trading Floor

It is that part of the secondary market through which inheritance and inter-family transaction take place and the transferring shall be done through the Securities Depository Centre (SDC) as of the same date.

4.5 Listing Rules

Any company wishes to list its securities in the ASE market, according to the security law No.76 of 2002, must fulfill some of the requirements of the market. The company must be aware that its securities are registered with the JSC, are deposited with the securities Depositary Center (SDC), there must be no the transfer of ownership of the relevant securities, the issuer of the security must have an audit committee, and to determine the rights and obligations between the issuer an the market, the issuer must sign a listing agreement with the ASE. Once these requirements have been fulfilled the company's securities are listed in the ASE. However, to be traded at the second market, the company must have acquired the right to start its operations and must provide

ASE with the following statements and information (www.ase.com.jo) :

1. The company's Articles of association, charter and prospectus.
2. The company's Annual Report for the last fiscal year (if any), including the board of director's report, financial statements and the auditors report.
3. the relationship between the company requesting to the listed and other companies whether it was the mother, subsidiary or affiliate (if any).
4. Names of the board of directors, the positions of the top executive personal, and any securities owned by them or any of their relatives, and the membership of any of any of them in any board of directors of other companies.
5. Names of investors owning 5% or more of the company's shares.
6. A statement shows the name of the shareholders, number of shares owned by each one, and the percentage of non-Jordanian shareholders in the company.
7. Any other information the ASE sees it nessecary to be taken into consideration for the listing approval.

The company's shall be transferred from the second market to the first market subject to some conditions (www.ase.com.jo) :

1. If the company was listed at the least for on of year on the second market.
2. the net shareholders equity ratio to the paid in capital must not be less than 100%.
3. making pre-tax profit for at least two fiscal years out of the last three years preceding the transfer of listing.
4. the number of trading days on the company's shares must not be less than 20% of overall trading days over the last twelve months.
5. the number of shareholders at the end of the fiscal year must not be less than 100.
6. the free float to the subscribe shares ratio must be at the end of the fiscal year not less than 5% if the company's paid in capital 50 million Jordan dinars .

Once the company is listed at the first market and failed to achieve the previous conditions it well be retransferred to the second market (www.ase.com.jo).

4.6 The Trading Process in ASE

The most significant change in 1999 of ASE is the trading process has been changed from the traditional face-to-face trading between brokers, to an electric trading through computer screens. This change enabled brokers to carry out transactions in locations other than the ASE.

The internal by-Law of the ASE defined the trading process as : Trading securities in the Stock Exchange shall take place by trading contracts between members, each on behalf of his/her client or portfolio. Said contracts shall be confirmed in entries in the Stock Exchange records. Members stand for the members of ASE. Which represents the financial service companies licensed by JSC to perform financial brokerage activities. Trading days and times at ASE are from Sunday to Thursday, 9:30-12:15. The trading session on ASE (as was mentioned in the internal by-Law of the ASE,2002) is divided into four stages;

Stage One: at this stage is no trading; brokers just want to inquire information about stock closing prices, and the performance of the market in previous days.

Stage Two: is called the pre-opining stage. Here brokers aims to know the respondents of the market, brokers send order to the system, the system will determine the appropriate price but there will be no matching between orders.

Stage Three: is the opening stage. At this stage, orders will be matched together, no cancellation to orders will be allowed by

brokers, securities are bought and sold (traded) on continuous basis, which means that prices are determined continuously through the trading days as buyers and sellers submit orders. ASE officers in charge of monitoring have the right to cancel orders entered in the electronic trading system (ETS), related to selling and buying orders of given security, if the price or quantities will restrict the trading on the particular security.

Stage four : the Chief Executive Officer (CEO) of the ASE at this stage will review the prices of stocks in order to determine the closing price, which is to be the price of the last transaction in the trading session. The CEO is authorized to adjusted the closing price of a specific security; if it was proven that the price of the last transaction was to influence the closing price of that price of that security.

ASE imposes daily price limits on the stock prices. These limits are the stated in terms of plus or minus a specific percentage of the previous day's closing price. Such action is taken to protect small investors from those investors who can influence stock prices by selling and buying large quantities in the trading session these limits were changed through the years, it was 10% then on 1991 the first Gulf War the price limits were reduced to 2% to reduce fluctuations on stock prices, because it is thought that the stock market will be less volatile when price limits are more restrictive (Kim,2001). These days, the daily price limits are plus or minus 5% (Al-khouri & Ajlouni, 2007) .

Daily price limits have major implication on stock prices, such as producing high correlation between stock prices, making future prices predictable, and reducing the efficiency of the mark and hindering the formation of efficient portfolios (Al-khouri & Ajlouni, 2007).

4.7 Transparency in the ASE

Market transparency is a central feature of financial markets. It is the ability of market participant to monitor relevant information about trading transaction such as, description of the security, the size, price and data of transaction (www.ase.com.jo) .

It was found that liquidity is affected by transparency; low level of transparency means that the market participants will not be given the relevant transaction information at a timely manner, therefore, buyers and sellers will not meet to exchange the transaction and vise versa (British Banker's Association, 2002).

Moreover, market liquidity is directly related to the existence of market makers who are willing to buy or sell securities from their own account when public orders (buying and selling securities) are thin.

Therefore, market makers will likely add to the market high level of liquidity and transparency. Emerging market have low level of transparency due to the less development trading technology, and are illiquid due to the law transparency and nonexistence of market makers (Emerging Market Committee, 1999).

The ASE display the top of the order book; that is the best bid and ask (market tightness), as well as the other orders on the book (market depth).

The ASE display, provides on-line trading information on share prices, Market depth and indices during the trading session via its official website. It maintains an investor gallery to provide investors with on-line access to trading issues news and statistical bulletins; with comprehensive information on the ASE, its establishment, management, regulations and instruction, as well as any other information important to investors are provided on the website too (www.ase.com.jo) .

4.8 The ASE Performance

Market Performance can be tested by looking at some of the major quantitative indicators, such as the number of the listed companies, market capitalization and the daily turnover ratio.

ASE market has witnessed an increase in the number of listed companies throughout the years, which gives an indication of an economic growth in Jordan. Market capitalization is directly related to the number of listed companies. It is calculated by multiplying the current price of shares by the number of current listed shares. Market capitalization also increased since the establishment of the ASE market (www.ase.com.jo) .

The average daily turnover is the ratio of the trading Value to the market capitalization at the end of the day. This ratio is used to

describe the trading activity of the market whether the market is characterized by active or thin market. One of the major actions that might affect the trading activity and by then the average daily turnover is the ownership structure of the market. The ASE market ownership is a composite of individual investors (Jordanian and foreign investors), institutional, and government (www.ase.com.jo) .

4.9 ASE Main Indices

ASE indices are used to portray the pattern of stock price movement, and to measure the performance of the ASE in terms of return. Back in 1980, the Amman Financial Market (AFM) constructed an Unweighted Price Index supplemented by sub-indices for the four sectors: Banking and Finance Companies, Insurance, Services and Industrial. At that time 38 stocks were covered and a base value of 100 was stipulated on the opening session of January 1st 1980. The base was changed to 1000 as of January 1st 2004 (www.ase.com.jo) .

As a result of a long statistical study, then AFM began in 1992 to calculate a Market Capitalization Weighted Price Index covering 50 stocks increased to 60 stocks in 1994, then to 70 stocks in 2001 and to 100 in 2007. A base value of 100 points on December 31st, 1991 was stipulated for the Weighted Price

Index. The base was changed to 1000 as of January 1st 2004 (www.ase.com.jo) .

Recently, as a result of the global development in the domain of the indices calculation, beside aiming to raise the capability of these indices to reflect market performance, ASE constructed a new index that is based on Free Float Shares, which provides a better representation of the share prices movement in the market without bias to large cap companies, thus limiting their impact on the index (www.ase.com.jo) .

The index is calculated using the market value of the free float shares of the companies and not the total number of listed shares of each company. This method is notably used by many international institutions that calculate the indices for most of world countries and that are considered leading international companies in the area of indices-related services, such as S&P's, FTSE Group, Dow Jones and STOXX (www.ase.com.jo) .

The methodology of Dow Jones and STOXX were applied in selecting the index constituents. The index universe is defined as all companies domiciled in Jordan, with their primary listing at the ASE. Eliminated from the index universe are companies which belong to the bottom 1% by full market capitalization and companies which do not trade more than 33.33% of all trading days per quarter. The largest 100 companies remaining by full market capitalization will be included in the index. Weights of

individual stocks are capped at 10% in order to prevent the index from being dominated by individual securities (www.ase.com.jo) .

ASE indices are calculated using the latest closing prices and published on a daily basis. ASE indices are composed of companies listed at the First and Second Markets, the selection of these companies is based on the following five criteria which represent the companies' size and liquidity : Market capitalization, days traded, turnover ratio, value traded and the number of shares traded. Also the sector representation is considered when selecting these companies. The ASE indices are adjusted to maintain their continuity and to safeguard them from exceptional events. These adjustments allow the indices to perfectly mirror the market trend. The constituents of the ASE indices are reviewed and adjusted quarterly. Non-periodic adjustments can be made for stocks whose trading will be halted for a long time or permanently (www.ase.com.jo) .

4.9.1 Weighted Price Index

The ASE Market Capitalization Weighted Index is presently made up of the most liquid and largest 100 companies from the First and Second Markets. The company's weight in the index is determined by its relative percentage of the aggregate market capitalization of the 100 companies. A base value of 100 points on December 31st, 1991 was stipulated for the ASE weighted index. The stocks included in the index represent around 90% of

the aggregate market capitalization of the listed companies at the regular market (www.ase.com.jo). Appendix (A1) provides a list of the 100 companies that made up this index. The ASE weighted price index is supplemented by sub-indices for the four sectors: Banking and Finance Companies, Insurance, Services and Industrial sector. The base was changed to 1000 as of January 1st 2004. The ASE weighted index provides a comprehensive measure of the market trend to investors or institutions who may be interested in general market price movement (www.ase.com.jo) .

The index is calculated using the Paasche method.

The general formula for the index (t) is:

At t=1,

Index = 1000

B1 = M1, or market capitalization = base value of the index

At t>1,

Index (t) = (Mt/Bt)*1000

Bt = Bt-1*(Mt/Mad)

Mad = Mt - It - Nt + Qt-1

Where,

t : time period

index (t) : index at time t

Bt : base value of index

Mt : market capitalization of constituents at time t (the sum of the market capitalization of all stocks included in the index)

Mad : adjusted market capitalization at time t. The adjustments are done for new issues of shares, and the addition or deletion of constituents

It : market capitalization of new shares issued by a company included in the index and listed at time t

Nt : market capitalization of the company added to the index at time t

Qt-1 : market capitalization of the company at time (t-1) which deleted of the index at time t

The base value Bt is an adjusted base (market capitalization) which is not the real market capitalization at the base period.

No adjustment is made, however, in case of a stock split, bonus shares (stock dividend) and a decrease in 1 paid-in capital, since such corporate actions do not affect the current market capitalization. Thus, adjustments are done for any changes in index sample or any corporate action affecting the market capitalization on index stocks. This can be achieved by using the adjustment factor Mad. Without any adjustments, such changes would cause sudden and sharp movements of the index value which would not reflect the market's actual behavior (www.ase.com.jo) .

4.9.2 Free Float Index

One of the features of this index is giving better reflection for the changes of stocks prices in the market by not being biased to the companies that have large market capitalization, thus, providing diversification in the index sample by giving better chances to small and medium companies to reflect the index.

This index was given the base value of 1000 points as of the closing of the year 1999. This index based on the free float shares, whereby the index is calculated using the market value of the free float shares of the companies and not the total number of listed shares of each company (www.ase.co.jo) .

This formula is used to calculate general index,

$$\text{Index } t \; : \; \frac{\Sigma \; (Pti \times Sti \times Fti)}{Dt}$$

Where:

Pti : closing price of the company **i** on day (**t**)

Sti : number of listed shares of the company **i** on day (**t**)

Fti : the factor of the company **i** on day (**t**)

Dt : divisor index on day (**t**)

The factor (F) is a number between zero and one. The calculation of this factor depends on the company free float

ratio that represents the total listed shares minus the shares owned by the board of directors, investors who owned more than 5% and any government ownership. The value of this factor is changed quarterly by the ASE at the time of the index re-balancing (www.ase.com.jo) .

4.9.3 Unweighted Price Index

In the ASE Unweighted Index, all stocks carry equal weight. There is no consideration of the market capitalization, and the price level does not have an impact because the index formula deals with percentage changes only. Such an index can be used by an investor who invests equal amounts of money in each stock in his/her portfolio. This index has been introduced in 1980 with the opening session of January 1st 1980 set at 100 points. In 1992, the ASE introduced some modifications to the index, of which was the changing of the base period to December 31st 1991. The unweighted index is supplemented by sub-indices for the four sectors: Banking and Finance Companies, Insurance, Services and Industrial. The base was changed to 1000 as of January 1st 2004 (www.ase.com.jo) .

The general and sectoral indices are calculated using the following method:

$$\text{Index (t)} = \text{Exp}(\text{Ln}(10)*S)*1000$$

Where,

S = (Log (Pti / Poi)) / n

n : sample size

t : time period

Exp : Exponential function to the base (e)

Ln : Natural Logarithm to the base (e)

Log : Logarithm to the base (10)

Index (t) : Index value at time t

Pti : Closing price of the ith stock at time t

Poi : Closing price of the ith stock at the base period

The unweighted index uses the logarithmic function to smooth the extreme prices fluctuations. The above formula is similar to using the geometric average of the percent changes of the stock prices of the index constituents. Adjustments are made to the prices when stock splits or stock dividends occur. Additions or deletions of stocks can be adjusted by computing an adjustment factor C which is equal to the value of the index after the addition or deletion takes place divided by value of the index before. After that, the index will be multiplied by the factor C,

i.e. C = (Index after the addition or deletion)/(Index before the addition or deletion)

Index (t) = C*Exp (Ln(10)*S)*1000

Note that the factor C will be used on the day of the adjustment and thereafter. The adjustment factor C is calculated in such a way that, at constant stock prices, the value of the index before and after the addition or deletion remains exactly the same (www.ase.com.jo) .

Chapter Five

Data and Methodology

5.1 introduction

This chapter contains the methodology used in the study in order to test the study hypothesis, as well as the data collected, population and sample of study. It defines the main variables to be measured, indicates the research instrument and specifies the model used in the study.

5.2 The Data : The Population and the sample of the study

The data for this study is obtained from the Department of Research and International Relationship in ASE and the internet. For the theoretical framework data it was obtained from thesis, publishes articles in academic journals and in the search engines from the internet related to subject.

The population of the study includes ASE.

The sample of this study include the Three main indices of ASE during the period (2005-2009). These are :

(1) Free Float Index .

(2) Weighted Index.

(3) Unweighted Index.

And the name of the sectors that included under the Free Float index in ASE: General, Financials, Services and Industries.

But weighted index and unweighted index include the following sector : General, Banks, Insurance, Services and Industries.

The table below explain the summary of annual rate of return of the main indices and each sector during the period (2005-2009):

Table (5-1) The Annual rate of return during the period (2005-2009) this Table calculated by researcher.

Main Indices		2005	2006	2007	2008	2009
Free Float Index	General Index	56.08% *	-29.25%	21.94%	-24.94%	-8.15%
	Financials	91.80%	-33.37%	14.37%	-29.66%	-16.13%
	Services	27.23%	-18.87%	34.22%	-17.67%	4.07%
	Industries	17.93%	-15.74%	30.58%	-11.68%	0.10%
Weighted Index	General Index	92.94%	-32.64%	36.27%	-16.97%	-11.58%
	Banks	133.61%	-36.63%	29.73%	-18.05%	-17.68%
	Insurance	98.09%	-43.70%	17.90%	-22.02%	3.20%
	Services	77.79%	-31.39%	19.84%	-31.92%	-8.84%
	Industry	14.90%	-13.63%	82.07%	-0.12%	0.07%
Unweighted Index	General Index	42.02%	-26.28%	11.81%	-31.29%	-14.39%
	Banks	57.61%	-26.78%	19.54%	-20.28%	-14.57%
	Insurance	104.75%	-32.39%	15.12%	-28.59%	-2.25%
	Services	95.86%	-32.31%	13.71%	-35.72%	-16.78%
	Industry	0.94%	-17.88%	5.89%	-26.80%	-9.75%

*This Value represent {(index price in the last day of 2005)-(index price in the last day of 2004)} / (index price in the last day of 2004)

5.3 The Hypothetical Model

Predictive regression is common in the financial literature. It has been used to test whether past prices, financial ratios , interest rates and the variety of other macroeconomic variables can forecast stock returns. To estimate a regression model, this study uses the historical approaches as a model to calculate VaR. Since this study examines the ability of VaR in estimating the expected return of the ASE indices during the period (2005-2009), it is necessary to test the impact of market risk variable and the relative amount of the influence on the expected return.

Therefore, the following model will be used to measure the impact of independent variable (VaR) on dependent variable (index return).

$$\mathbf{R_{i,t} = \mathit{f}(VaR_{it})} \qquad \mathbf{(5.1)}$$

Where;

$R_{i,t}$: index (i) rate of return at time t.

$VaR_{I,t}$: Value at Risk of Index (i) at time t.

Accordingly to the Simple regression model

$$R_{i,t} = b_0 + b_1 \, VaR_{i,t} + e \qquad (5.2)$$

where;

b_0 : is the constant return .

b_1 : is the coefficients .

e : represent the residual error term that assumed to be normally identically and dependently distributed.

5.4 Variables

This study intends to identify the impact of VaR on return of ASE Indices. Therefore, this section will present the variables used in the regression model which is shown below:

$$R_i = \text{logarithm of daily Index return} = \frac{P_{I,t} - P_{I,t-1}}{P_{I,t-1}}$$

$$VaR_i = \text{logarithm of daily VaR} = \alpha \, . \, \sigma \, . \sqrt{T}$$

5.4.1 The Dependent Variable

Index return (Ri) considered as a dependent variable which is measured by the logarithm of daily stock return:

$$R_{i,t} = (P_{i,t} - P_{i,t-1}) \, / \, P_{i,t-1} \qquad (5.3)$$

where;

$R_{i,t}$: is the realized return on index i at time t.

$P_{i,t}$: is the closing price of index i in the day t

$P_{i,t-1}$: is the closing price of index i in day (t-1).

The price in day (t) is the price of the last operation realized in the day. Logarithm of index return used because most studies estimated that index return follow a lognormal distribution. Fama and French (1988), Nelson and Kim (1993) and Campbell and Shiller (1988) have documented that, dividend yield predicates stock returns with some success, as it captures expectations about dividend growth as well as expected returns.

5.4.2 Independent variables

Value at Risk (VaR) considered as a independent variable which is measured by the logarithm of daily Value at Risk. We defined the value at risk as the highest possible loss that can enter within a certain time with a certain trust level. As a basis formula the following equation applies in addition (Jorion, 2001) :

$$VaR = \alpha \cdot \sigma \cdot \sqrt{T} \qquad (5.4)$$

Where;

α : is the confidence level. It is the distance of the means measures in number of standard deviation. For example, 1.65 corresponding to 95%-confidence level. The 95% confidence intervals translate into 1.645 standard deviation on either side of the mean. This is also known as the "adjusted standard deviation ".

With 90% confidence interval, we would use 1.28 standard deviation . And 99% confidence interval would require 2.326 standard divinations.

σ : is the portfolio volatility, which is measured by the standard deviation of the yields. The variance is measure in units of x squared and thus is not directly comparable with the mean. The standard deviation, or volatility, is then defined as the square root of the variance.

$$SD(x) = \sqrt{V(x)} \qquad (5.5)$$

Again to shorten notation, SD(x) is written as σ. And it indicates a typical range of values around the mean.

$$\sigma^2 = (\Sigma (xi - \mu)^2 / (N-1)) \qquad (5.6)$$

where;
N : is the number of observations
μ : sample mean; the expected return on first moment,

$$\mu = E(x) \qquad (5.7)$$

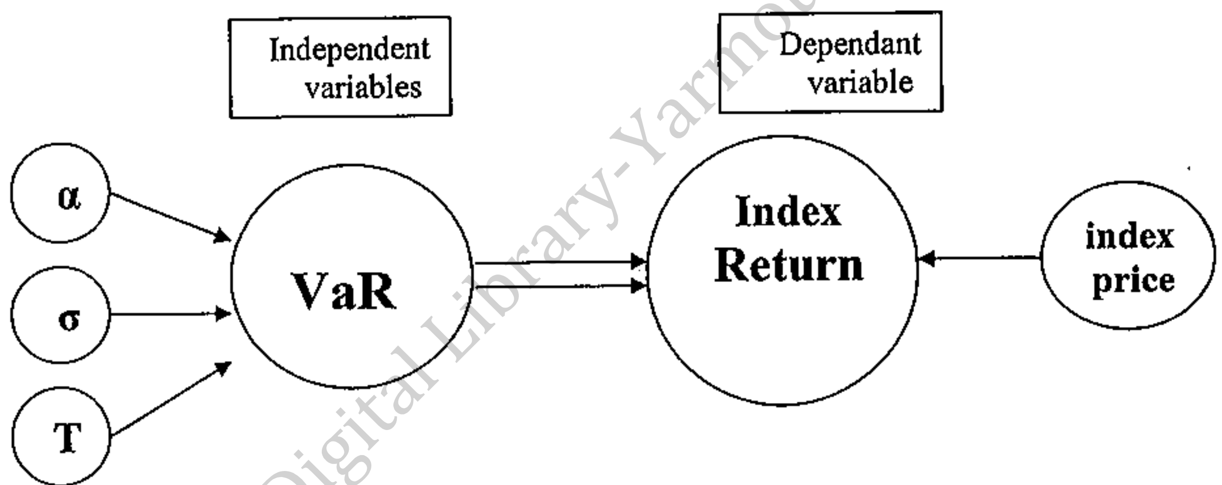
The square root of σ^2 is the standard deviation of x, often referred to as the volatility. It measures the risk of security as the dispersion of outcomes around its expected value .

T : is the time period .

The relation between the independent variable and dependent variable is shown in figure (5-1)below :

Figure (5-1)*

Model Framework of the relationship between index rate of return and Value at Risk



* This Framework prepared by the researcher

Chapter Six

Data Analysis

6.1 Introduction

Analysis of data is a process of inspecting, cleaning, transforming, and modeling data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains.

In this chapter, we introduces the analysis and its results in order to demonstrate the relationship of the VaR (independent variable) with the index return (dependent variable) and their impact through the statistical that used in this study .

6.2 Descriptive Statistics

The study uses mean and standard deviation of the data used for all indices and all sectors during the study period (2005-2009). Table (6-1) provides descriptive statistics for all daily indices and sectors during the period (2005-2009).

Table (6-1)

Descriptive statistics for all daily indices and sectors during the period (2005-2009)

The Indices	The sectors	Variables	Mean	Std. deviation	No. of observation
Free Float index	General Sector	R	0.000023	0.01295	1226
		VaR	0.0202	0.0061	1226
	Financial Sector	R	-0.00003	0.013259	1225
		VaR	0.02079	0.00647	1225
	Industries Sector	R	0.00023	0.01405	1226
		VaR	0.0206	0.0090	1226
	Services Sector	R	0.00023	0.01274	1226
		VaR	0.02004	0.00586	1226
Weighted Index	General Sector	R	0.00077	0.03696	1226
		VaR	0.04554	0.04032	1226
	Banks Sector	R	0.0007	0.0336	1226
		VaR	0.0448	0.0324	1226
	Insurance Sector	R	-0.00081	0.04859	1226
		VaR	0.0555	0.0580	1226
	Industries Sector	R	0.0007	0.0199	1226
		VaR	0.0298	0.0111	1226
	Services Sector	R	0.00035	0.03153	1226
		VaR	0.0407	0.0324	1226
Unweighted Index	General Sector	R	-0.00025	0.01084	1226
		VaR	0.01679	0.00526	1226
	Banks Sector	R	0.00003	0.01256	1227
		VaR	0.0199	0.0061	1227
	Insurance Sector	R	0.00016	0.01208	1227
		VaR	0.0186	0.0036	1227
	Industries Sector	R	-0.00039	0.01066	1227
		VaR	0.01675	0.00487	1227
	Services Sector	R	-0.00009	0.01321	1227
		VaR	0.0204	0.0064	1227

The table calculated by the researcher .

Table (6-1) shows that the mean value of daily index return for the general sector in free float index during the period (2005-2009) is (**0.000023**), with a standard deviation of (**0.01295**) this indicates small deviation due to the low variation in index returns.

And the mean value of daily index return for the general sectors in weighted index during the period (2005-2009) is (0.00077), with a standard deviation of (0.03696) this indicates small deviation due to the low variation in index returns.

And the mean value of daily index return for the general sectors in unweighted index during the period (2005-2009) is (**-0.00025**), with a standard deviation of (**0.01084**) which this indicates small deviation due to the low variation in index returns.

6.3 Testing Hypotheses of the Study

This study uses one variable entered in the model (VaR) and one dependent variable (Index return R). Therefore, the study empirical model is represented in the following equation:

$$Ri = \beta 0 + \beta 1 \, VaR + \varepsilon \qquad (1)$$

Ri : Index Return.

β0: constant parameter.

β1: coefficient parameter for independent variable

ε: residual term error .

This model will be implemented in each index of each sector, according to the following hypothesis :

6.3.1 Hypothesis 1: There is a positive relationship between VaR and Free Float index-return for financial sector.

$$Ri = f(VaR\ i) \qquad (2)$$

To test the relationship, the regression models is used as follow :

$$R\ i = \beta 0 + \beta 1 VaR + \varepsilon \qquad (3)$$

Ri: Dependent variable (Index Return)

Table (6-2) shows the coefficient output.

Table (6-2)

The Relationship between VaR in Financial Sector and the Free Float Index of return

Variable	Undstandardized Coefficient		t	Sig.
	β	Std. error		
(constant)	0.0020	0.0013	1.5699	
VaR	-0.0994	0.0582	-1.7095	0.0160

Dependent variable: Ri

The result reveal in table (6-2) that the regression equation is

Ri = 0.0020 - 0.0994 VaR

The constant (β0) is the value of the mean stock return (R) when predictors are zero.

The index return (R) changes by "-0.0994" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-3)

ANOVA test of Variance between Free Float Index-Return & VaR for Financial Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	1	0.0005	0.0005	2.9225	0.0876
Residual	1222	0.2115	0.0002		
Total	1223	0.2120			

R square = 23.9%
Predictor: (constant), VaR, Dependent Variable: Ri

The results in table (6-3) indicate that the model presented in equation (3) is valid and significant at ≤ 10% level of significant. The coefficient of determination (R^2) determines that the proportion of the variations in Financial Sector of Free Float Index Return (R) that is explained by variation in VaR of Financial Sector (explanatory variable), is 23.9% , which is weak . This result indicates that there are other factors that determine

the level of the Financial Sector return of the Free Float Index return .

6.3.2 Hypothesis 2: There is a positive relationship between VaR and Free Float index-returns for Industrial sector.

$$Ri = f(VaR) \qquad (4)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (5)$$

R: Dependent variable (Index Return)

Table (6-4) shows the coefficient output.

Table (6-4)

The Relationship between VaR in Industrial Sector and the Free Float Index-return

Variable	**Undstandardized Coefficient**		**t**	**Sig.**
	B	**Std. error**		
(constant)	**0.0026**	**0.0010**	**2.6011**	
VaR	**-0.1167**	**0.0445**	**-2.6222**	**0.0125**

Dependent variable: Ri

The result reveal in table (6-4) that the regression equation is

Ri = 0.0026 -0.1167 VaR

The constant (β0) is the value of the mean stock return (R) when the predictors are zero.

The index-return (R) changes by "-0.1167" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-5)

ANOVA test of Variance between Free Float Index-Return & VaR for Industrial sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0013**	**0.0013**	**6.8760**	**0.0088**
Residual	**1223**	**0.2394**	**0.0002**		
Total	**1224**	**0.2408**			

R square = 55.9%
Predictor: (constant), VaR, Dependent Variable: Ri

The results in table (6-5) indicate that the model presented in equation (5) is valid and significant at ≤ 10% level of significance.

The coefficient of determination (R^2) determines that the proportion of the variations in Industrial Sector of Free Float Index Return (R) that is explained by variation in VaR of Industrial Sector (explanatory variable), is 55.9% , which is acceptable using simple regression. This result indicates that there are other factors that determine the level of the Industrial Sector return of the Free Float Index.

6.3.3 Hypothesis 3: There is a positive relationship between VaR and Free Float index-returns for Services sector.

$$Ri = f(VaR) \qquad (6)$$

To test the relationship, the regression model is used as follow:

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (7)$$

R : Dependent variable (Index Return)

Table (6-6) shows the coefficient output.

Table (6-6)

The Relationship between VaR in Services Sector and the Free Float Index

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0040	0.0013	3.0686	
VaR	-0.1876	0.0618	-3.0373	0.0135

Dependent variable: Ri

The result reveal in table (6-6) that the regression equation is

$$\mathbf{Ri = 0.0040 - 0.1876\ VaR}$$

The constant (β0) is the value of the mean index-return (R) when the predictors are zero.

The index return (R) changes by "-0.1876" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-7)

ANOVA test of Variance between Free Float Index Return &

VaR For Services sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0015**	**0.0015**	**9.2255**	**0.0024**
Residual	**1223**	**0.1959**	**0.0002**		
Total	**1224**	**0.1973**			

R square = 74.9%
Predictor: (constant), VaR, Dependent Variable: Ri

The results in table (6-7) indicate that the model presented in equation (7) is valid and significant at is ≤10% level of significance .

The coefficient of determination (R^2) determines that the proportion of the variations in Services Sector of Free Float Index-Return (R) that is explained by variation in VaR of Services Sector (explanatory variable), is 75% , which is strong. This result indicates that there are other factors that determine the level of the Industrial Sector of the Free Float Index.

6.3.4 Hypothesis 4: There is a positive relationship between VaR and Free Float index-returns for General sector.

$$Ri = f(VaR) \qquad (8)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (9)$$

R: Dependent variable (Index Return)

Table (6-5) shows the coefficient output.

Table (6-8)

The Relationship between VaR in General Sector and the Free Float Index

Variable	**Under standardized Coefficient**		**t**	**Sig.**
	B	**Std. error**		
(constant)	**0.0036**	**0.0013**	2.8572	
VaR	**-0.1803**	**0.0603**	-2.9922	**0.0133**

Dependent variable: Ri

The result reveal in table (6-8) that the regression equation is

Ri = 0.0036 -0.1803 VaR

The constant (β0) is the value of the mean stock return (y) when the predictors are zero.

The index return (Y) changes by "-0.1803" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-9)

ANOVA test of Variance between free Float Index-Return & VaR for General Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0015**	**0.0015**	**8.9531**	**0.0028**
Residual	**1223**	**0.2025**	**0.0002**		
Total	**1224**	**0.2040**			

R square = 72.7%
Predictor: (constant), VaR, Dependent Variable: Ri

The results in table (6-9) indicate that the model presented in equation (9) is valid and significant at ≤ 10% level of significant. The coefficient of determination (R^2) determines that the proportion of the variations in General Sector of Free Float Index-Return (R) that is explained by variation in VaR of General Sector (explanatory variable), is 72.7% , which is strong. This result indicates that there are other factors that determine the level of the Industrial Sector return of the Free Float Index.

6.3.5 Hypothesis 5: There is a positive relationship between VaR and Weighted index-returns for General sector.

$$Ri = f(VaR) \qquad (10)$$

To test the relationship, the regression models is used as follow :

$$R = \beta0 + \beta1 VaR + \varepsilon \qquad (11)$$

R: Dependent variable (Index Return)

Table (6-10) shows the coefficient output.

Table (6-10)

The Relationship between VaR in General Sector and the Weighted Index return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	-0.0007	0.0016	-0.4212	
VaR	0.0310	0.0262	1.1837	0.017

Dependent variable: Ri

The result reveal in table (6-10) that the regression equation is

Ri = -0.0007+ 0.0310 VaR

The constant (β0) is the value of the mean index return (R) when the predictors are zero.

The index return (R) changes by "0.0310" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-11)

ANOVA test of Variance between Weighted Index Return & VaR for General Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0019**	**0.0019**	**1.4012**	**0.2368**
Residual	**1223**	**1.6696**	**0.0014**		
Total	**1224**	**1.6716**			

R square =11.44%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-11) indicate that the model presented in equation (11) is valid and significant at ≤ 10% level of significance.

The coefficient of determination (R^2) determines that the proportion of the variations in General Sector of Free Float Index

Return (R) that is explained by variation in VaR of General Sector (explanatory variable), is 11.44% , which is weak . This result indicates that there are other factors that determine the level of the General Sector return of the weighted Index.

6.3.6 Hypothesis 6: There is a positive relationship between VaR and Weighted index-returns for Banks Sector.

$$Ri = f(\text{VaR}) \quad (12)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1\text{VaR} + \varepsilon \quad (13)$$

R: Dependent variable (Index Return)

Table (6-12) shows the coefficient output.

Table (6-12)

The Relationship between VaR in Banks Sector and the Weighted

Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	-0.0004	0.0016	-0.2603	
VaR	0.0244	0.0296	0.8245	0.0221

Dependent variable: Ri

The result reveal in table (6-12) that the regression equation is

Ri = -0.0004 +0.0244 VaR

The constant ($\beta 0$) is the value of the mean index-return (R) when the predictors are zero.

The index-return (R) changes by "0.0244" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-13)

ANOVA test of Variance between Weighted Index-Return & VaR for Banks Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0008**	**0.0008**	**0.6798**	**0.4098**
Residual	**1223**	**1.3765**	**0.0011**		
Total	**1224**	**1.3773**			

R square =5.56%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-13) indicate that the model presented in equation (13) is valid and significant since P-value is ≤ 10% level of significance.

The coefficient of determination (R^2) determines that the proportion of the variations in General Sector of Free Float Index Return (R) that is explained by variation in VaR of Banks Sector (explanatory variable), is 5.56% , which is so weak . This result indicates that there are other factors that determine the level of the Banks Sector return of the weighted Index.

6.3.7 Hypothesis 7: There is a positive relationship between VaR and Weighted index-returns for Insurance Sector.

$$Ri = f(VaR) \qquad (14)$$

To test the relationship, the regression model is used as follow:

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (15)$$

R: Dependent variable (Index Return)

Table (6-14) shows the coefficient output.

Table (6-14)

The Relationship between VaR in Insurance Sector and the Weighted Index return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	-0.0004	0.0019	-0.2098	
VaR	-0.0078	0.0240	-0.3269	0.0267

Dependent variable: Ri

The result reveal in table (6-14) that the regression equation is

Ri = -0.0004 -0.0078 VaR

The constant (β0) is the value of the mean index-return (R) when the predictors are zero.

The index-return (R) changes by "-0.0078" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following:

Table (6-15)

ANOVA Test of Variance between Weighted Index-Return & VaR for Insurance sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0003**	**0.0003**	**0.1068**	**0.7438**
Residual	**1223**	**2.8908**	**0.0024**		
Total	**1224**	**2.8910**			

R square =87%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-15) indicate that the model represented in equation (15) is valid and significant since P-value is ≤ 10% level of significance.

The coefficient of determination (R^2) determines that the proportion of the variations in Insurance Sector of Weighted

Index Return (R) that is explained by variation in VaR of Insurance Sector (explanatory variable), is 87% , which is so strong. This result indicates that the VaR determine the level of the Insurance Sector return of the weighted Index.

6.3.8 Hypothesis 8: There is a positive relationship between VaR and Weighted Index-returns for Industrial Sector.

$$Ri = f(VaR) \quad (16)$$

To test the relationship, the regression model is used as follow:

$$R = \beta 0 + \beta 1 VaR + \varepsilon \quad (17)$$

R: Dependent variable (Index Return)

Table (6-16) shows the coefficient output.

Table (6-16)

The Relationship between VaR in Industrial Sector and the Weighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0023	0.0016	1.4398	
VaR	-0.0571	0.0513	-1.1129	0.0159

Dependent variable: Ri

The result reveal in table (6-16) that the regression equation is

Ri = 0.0023 - 0.0571 VaR

The constant (β0) is the value of the mean stock return (R) when the predictors are zero.

The index return (R) changes by "-0.0571" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-17)

ANOVA test of Variance between Weighted Index-Return & VaR Industrial Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.00049**	**0.00049**	**1.238583**	**0.265963**
Residual	**1223**	**0.483926**	**0.000396**		
Total	**1224**	**0.484416**			

R square =10.1%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-17) indicate that the model represented in equation (17) is valid and significant at ≤ 10% level of significance.

The coefficient of determination (R^2) determines that the proportion of the variations in Industrial Sector of Weighted Index Return (R) that is explained by variation in VaR of

Industrial Sector (explanatory variable), is 10.1% , which is weak . This result indicates that there are other factors that determine the level of the Industrial Sector return of the weighted Index.

6.3.9 Hypothesis 9 : There is a positive relationship between VaR and Weighted index-returns for Services Sector.

$$Ri = f(VaR) \qquad (18)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (19)$$

R : Dependent variable (Index Return)

Table (6-18) shows the coefficient output.

Table (6-18)

The Relationship between VaR in Services Sector and the Weighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0012	0.0014	0.8364	
VaR	-0.0219	0.0278	-0.7868	0.0188

Dependent variable: Ri

The result reveal in table (6-18) that the regression equation is

Ri =0.0012 -0.0219 VaR

The constant (β0) is the value of the mean stock return (R) when the predictors are zero.

The index return (R) changes by "-0.0078" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-19)

ANOVA Test of Variance between Weighted Index Return & VaR Services

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0006**	**0.0006**	**0.6190**	**0.4316**
Residual	**1223**	**1.2158**	**0.0010**		
Total	**1224**	**1.2164**			

R square = 50.6%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-19) indicate that the model presented in equation (19) is valid and significant since P-value is ≤ 10% level of significance .

The coefficient of determination (R^2) determines that the proportion of the variations in Services Sector of Weighted Index Return (R) that is explained by variation in VaR of Services Sector (explanatory variable), is 50.6% , which is acceptable in simple regression. This result indicates that there are other factors that determine the level of the Services Sector of the weighted Index.

6.3.10 Hypothesis 10 : There is a positive relationship between VaR and Unweighted index-returns for General Sector.

$$Ri = f(VaR) \qquad (8)$$

To test the relationship, the regression models is used as follow :

$$R = \beta0 + \beta1VaR + \varepsilon \qquad (9)$$

R : Dependent variable (Index Return)

Table (6-20) shows the coefficient output.

Table (6-20)

The Relationship between VaR in General Sector and the Unweighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0016	0.0010	1.5793	
VaR	-0.1131	0.0586	-1.9289	0.0123

Dependent variable: Ri

The result reveal in table (6-20) that the regression equation is

Ri =0.0016 -0.1131 VaR

The constant ($\beta 0$) is the value of the mean stock return (R) when the predictors are zero.

The index return (R) changes by "-0.1131" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-21)

ANOVA Test of Variance between Unweighted Index-Return &

VaR for General sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0004**	**0.0004**	**3.7207**	**0.0540**
Residual	**1223**	**0.1427**	**0.0001**		
Total	**1224**	**0.1432**			

R square =30.31%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-21) indicate that the model represented in equation (21) is valid and at is ≤ 10% level of significant .

The coefficient of determination (R^2) determines that the proportion of the variations in General Sector of Unweighted Index Return (R) that is explained by variation in VaR of General Sector (explanatory variable), is less than 1% , which is so weak . This result indicates that there are other factors that determine the level of the General Sector return of the Unweighted Index.

6.3.11 Hypothesis 11 : There is a positive relationship between VaR and Unweighted index-returns for Banks Sector.

$$Ri = f(VaR) \quad (22)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \quad (23)$$

R : Dependent variable (Index Return)

Table (6-22) shows the coefficient output.

Table (6-22)

The Relationship between VaR in Banks Sector and the Unweighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0018	0.0012	1.4812	
VaR	-0.0905	0.0583	-1.5534	0.0168

Dependent variable: Ri

The result reveal in table (6-22) that the regression equation is

Ri =0.0018 - 0.0905 VaR

The constant (β0) is the value of the mean stock return (R) when the predictors are zero.

The index return (R) changes by "-0.0905 " unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-23)

ANOVA Test of Variance between Unweighted Index Return & VaR for Banks Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0004**	**0.0004**	**2.4131**	**0.1206**
Residual	**1223**	**0.1916**	**0.0002**		
Total	**1224**	**0.1920**			

R square = 19.68%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-23) indicate that the model presented in equation (23) is valid and significant at ≤ 10% level of significance .

The coefficient of determination (R^2) determines that the proportion of the variations in Banks Sector of Unweighted Index Return (R) that is explained by variation in VaR of Banks Sector (explanatory variable), is 19.68% , which is weak . This result indicates that there are other factors that determine the level of the Banks Sector return of the Unweighted Index.

6.3.12 Hypothesis 12 : There is a positive relationship between VaR and Unweighted index returns for Insurance Sector.

$$Ri = f(\text{VaR}) \qquad (22)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 \text{VaR} + \varepsilon \qquad (23)$$

R : Dependent variable (Index Return)

Table (6-24) shows the coefficient output.

Table (6-24)

The Relationship between VaR in Insurance Sector and the Unweighted Index return

Variable	**Under standardized Coefficient**		**t**	**Sig.**
	B	**Std. error**		
(constant)	**0.0065**	**0.0018**	**3.6296**	
VaR	**-0.3417**	**0.0944**	**-3.6186**	**0.0114**

Dependent variable: Ri

The result reveal in table (6-24) that the regression equation is

Ri = 0.0065 -0.3417 VaR

The constant (β0) is the value of the mean index return (R) when the predictors are zero.

The index return (R) changes by "-0.3417" unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-25)

ANOVA Test of Variance between Unweighted Index-Return & VaR for Insurance Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0019**	**0.0019**	**13.0943**	**0.0003**
Residual	**1223**	**0.1763**	**0.0001**		
Total	**1224**	**0.1782**			

R square = 1.0585%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-25) indicate that the model represented in equation (25) is valid and significant at ≤ 10% level of significant. The coefficient of determination (R^2) determines that the proportion of the variations in insurance Sector of Unweighted Index Return (R) that is explained by variation in VaR of

insurance Sector (explanatory variable), is more than 1% , which is strong . This result indicates that there are other factors that determine the level of the Insurance Sector return of the Unweighted Index.

6.3.13 Hypothesis 13 : There is a positive relationship between VaR and Unweighted index-returns for Industrial Sector.

$$Ri = f(VaR) \qquad (26)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (27)$$

R: Dependent variable (Index Return)

Table (6-26) shows the coefficient output.

Table (6-26)

The Relationship between VaR in Industrial Sector and the Unweighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0010	0.0011	0.9276	
VaR	-0.0847	0.0624	-1.3585	0.0139

Dependent variable: Ri

The result reveal in table (6-26) that the regression equation is

Ri =0,0010 -0.0847 VaR

The constant (β0) is the value of the mean index return (R) when the predictors are zero.

The index return (Y) changes by (-0.0847) unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-27)

ANOVA Test of Variance between Unweighted Index-Return & VaR for Industrial Sector

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	1	0.0002	0.0002	1.8455	0.1746
Residual	1223	0.1384	0.0001		
Total	1224	0.1386			

R square = 15.5%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-27) indicate that the model presented in equation (27) is valid and significant since P-value is ≤ 10% level of significant .

The coefficient of determination (R^2) determines that the proportion of the variations in Indusrtial Sector of Unweighted Index Return (R) that is explained by variation in VaR of Industrial Sector (explanatory variable), is 15.5% , which is weak . This result indicates that there are other factors that determine the level of the Industrial Sector return of the Unweighted Index.

6.3.14Hypothesis 14 : There is a positive relationship between VaR and Unweighted index-returns for services Sector.

$$Ri = f(VaR) \qquad (28)$$

To test the relationship, the regression models is used as follow :

$$R = \beta 0 + \beta 1 VaR + \varepsilon \qquad (29)$$

R : Dependent variable (Index Return)

Table (6-28) shows the coefficient output.

Table (6-28)

The Relationship between VaR in Services Sector and the

Unweighted Index-return

Variable	Under standardized Coefficient		t	Sig.
	B	Std. error		
(constant)	0.0021	0.0012	1.6690	
VaR	-0.1077	0.0584	-1.8450	0.0134

Dependent variable: Ri

The result reveal in table (6-28) that the regression equation is

Ri =0.0021 -0.1077 VaR

The constant (β0) is the value of the mean index return (R) when the predictors are zero.

The index return (R) changes by (-0.1077) unit when the VaR changes by 1 unit.

ANOVA test is used to show the analysis of variance relate index-return versus VaR. ANOVA tests whether there is a linear regression relationship between the independent Variable and predictors. The hypothesis tests are stated as following :

Table (6-29)

ANOVA Test of Variance between Index-Return & VaR

	d.f	Sum of Squares	Mean Squares	F	P-value
Regression	**1**	**0.0006**	**0.0006**	**3.4040**	**0.0653**
Residual	**1223**	**0.2123**	**0.0002**		
Total	**1224**	**0.2129**			

R square =27.73%
Predictor: (constant), VaR , Dependent Variable : Ri

The results in table (6-29) indicate that the model presented in equation (29) is valid and significant at ≤ 10% level of significant. The coefficient of determination (R^2) determines that the proportion of the variations in Services Sector of Unweighted Index-Return (R) that is explained by variation in VaR of Services Sector (explanatory variable), is 27.73% , which is weak . This result indicates that there are other factors that determine the level of the Services Sector return of the Unweighted Index.

Chapter
Chapter Seven

Conclusions an Recommendations

7.1 Conclusion

Amman Stock Exchange witnessed remarkable developments over the past years which are reflected through its trading mechanism. Most of the Tools that are used for calculating the variability and risk assessment are qualitative in nature and were not grounded on theory. We used VaR as a Risk measurement to show the relationship between VaR and xpected return. We found empirical evidence that value at risk explains the cross-sectional variation in expected return in ASE for the Main Indices for the period (2005-2009) . Therefore, this study provides an analysis in impact of VaR on the expected index return of main indices during the period of study Based on the result of the analysis and all attempts by us to enter the independent variable that may effect the dependent Variable-index return (Ri)- indicate that the best regression equation (6-3), which conclude the following result :

The study showed that the relationship between the index-return of dependent variable and their respective VaR measures was founded to be positive and significant .

7.2 Recommendations

In the light of the results of the study the researcher recommends the following :

1. The researcher recommends using the VaR as a risk measurement in the banks and all other sector .
2. The researcher recommend to study this topic because there is a few whom write in this topic .

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Appendix (A1)

List of Companies that made up the Market Capitalization Weighted index in 2010 .

Company's Name	Code	Factor
ARAB BANK	ARBK	0.0555
JORDAN ISLAMIC BANK	JOIB	0.2907
JORDAN KUWAIT BANK	JOKB	0.2675
THE HOUSING BANK FOR TRADE AND FINANCE	THBK	0.1010
ARAB JORDAN INVESTMENT BANK	AJIB	0.4096
UNION BANK	UBSI	0.1792
ARAB BANKING CORPORATION /(JORDAN)	ABCO	0.1283
INVEST BANK	JIFB	0.4821
CAPITAL BANK OF JORDAN	EXFB	0.6171
CAIRO AMMAN BANK	CABK	0.3780
BANK OF JORDAN	BOJX	0.4058
JORDAN NATIONAL BANK	JONB	0.5670
JORDAN INTERNATIONAL INSURANCE	JIJC	0.5132
THE ISLAMIC INSURANCE	TIIC	0.3455
ARAB GERMAN INSURANCE	AGICC	0.4842
AL BARAKAH TAKAFUL CO.LTD	ARAI	0.4656
FIRST INSURANCE	FINS	0.2186
DARKOM INVESTMENT	DRKM	0.5172
NATIONAL PORTFOLIO SECURITIES	NPSC	0.4931
JORDANIAN EXPATRIATES INVESTMENT HOLDING	JEIH	0.5695
JORDAN INVESTMENT TRUST	JOIT	0.2630
UNION INVESTMENT CORPORATION	UINV	0.3233
ARAB FINANCIAL INVESTMENT	AFIN	0.4241
ARAB EAST INVESTMENT	AEIV	0.5480
UNITED ARAB INVESTORS	UAIC	0.5840
FALCON FOR INVESTMENT & FINANCIAL SERVICES	FIFS	0.4882
AL-AMIN FOR INVESTMENT	AAFI	0.4641

UNITED FINANCIAL INVESTMENTS	UCFI	0.3916
INTERNATIONAL BROKERAGE & FINANCIAL MARKETS	IBFM	0.7370
INVESTMENT HOUSE FOR FINANCIAL SERVICES	INVH	0.4980
AL-AMAL FINANCIAL INVESTMENTS CO.	AMAL	0.6768
AMWAL INVEST	AMWL	0.5470
AL SANABEL INTERNATIONAL FOR ISLAMIC INVESTMENTS(HOLDING) PLC. CO.	SANA	0.3315
FIRST FINANCE	FIFI	0.4418
FUTURE ARAB INVESTMENT COMPANY	FUTR	0.2383
FIRST JORDAN INVESTMENT COMPANY PLC	FRST	0.4309
INTERNATIONAL CARDS COMPANY	CARD	0.3800
DIMENSIONS:JORDAN AND EMIRATES COMMERCIAL INVESTMENTS CORPORATION	JEDI	0.2200
DARAT JORDAN HOLDINGS	DARA	0.6500
UNITED GROUP HOLDINGS COMPANY PLC	UGHI	0.3660
ALISRAA FOR ISLAMIC FINANCE AND INVESTMENT	ISRA	0.3417
JORDAN DUBAI PROPERTIES	REIN	0.2475
RESOURCES COMPANY FOR DEVELOPMENT & INVESTMENT PLC	JOMA	0.1909
UNION LAND DEVELOPMENT CORPORATION	ULDC	0.4020
SPECIALIZED INVESTMENT COMPOUNDS	SPIC	0.6171
REAL ESTATE DEVELOPMENT	REDV	0.2600
ARAB REAL ESTATE DEVELOPMENT	ARED	0.6773
The Investors and Eastern Arab For Industrial and Real Estate Investments	IEAI	0.2550
ARAB EAST FOR REAL ESTATE INVESTMENTS CO	REAL	0.2810
AD-DULAYL INDUSTRIAL PARK & REAL ESTATE COMPANY P.L.C	IDMC	0.8243
JORDANIAN REALESTATE COMPANY FOR	JRCD	0.6857

DEVELOPMENT		
AMAD INVESTMENT & REAL ESTATE DEVELOPMENT	AMAD	0.5360
EMMAR INVESTMENTS & REALESTATE DEVELOPMENT	EMAR	0.5231
TAAMEER JORDAN HOLDINGS PUBLIC SHAREHOLDING COMPANY	TAMR	0.5677
METHAQ REAL ESTATE INVESTMENT	MEET	0.5815
THE PROFESSIONAL COMPANY FOR REAL ESTATE INVESTMENT AND HOUSING	PROF	0.6483
JORDAN MASAKEN FOR LAND & INDUSTRIAL DEVELOPMENT PROJECTS	MSKN	0.4714
AMOUN INTERNATIONAL FOR INVESTMENTS	AMON	0.7050
THE ARAB INTERNATIONL FOR EDUCATION & INVESTMENT.	AIEI	0.4920
ITTIHAD SCHOOLS	ITSC	0.3731
JORDAN TELECOM	JTEL	0.0694
AL-FARIS NATIONAL COMPANY FOR INVESTMENT & EXPORT	CEBC	0.6477
JORDAN ELECTRIC POWER	JOEP	0.7969
JORDAN PETROLEUM REFINERY	JOPT	0.7342
SALAM INTERNATIONL TRANSPORT & TRADING	SITT	0.3896
TRANSPORT& INVESTMENT BARTER COMPANY	NAQL	0.5690
MASAFAT FOR SPECIALISED TRANSPORT	MSFT	0.5394
ALIA- THE ROYAL JORDANIAN AIRLINES PLC.	RJAL	0.4200
RUM GROUP FOR TRANSPORTATION & TOURISM INVESTMENT	RUMM	0.4124
ARAB INTERNATIONAL HOTELS	AIHO	0.2915
AL-DAWLIYAH FOR HOTELS & MALLS	MALL	0.2878
AL-TAJAMOUAT FOR TOURISTIC PROJECTS CO PLS	MERM	0.2454
AL-RAKAEZ INVESTMENT CO.	RICS	0.4359
MODEL RESTAURANTS COMPANY PLC	FOOD	0.4116

AL AHLIA ENTERPRISES	ABLA	0.1962
SPECIALIZED JORDANIAN INVESTMENT	SIJC	0.3094
BINDAR TRADING & INVESTMENT CO . P.L.C	BIND	0.0757
SOUTH ELECTRONICS	SECO	0.9141
OFFTECHOLDING GROUP PLC	BDIN	0.3040
AFAQ FOR ENERGY CO. P.L.C	MANE	0.0300
COMPREHENSIVE LEASING COMPANY PLC	LEAS	0.2192
JORDAN PRESS FOUNDATION/AL-RA'I	PRES	0.3446
DAR AL DAWA DEVELOPMENT & INVESTMENT	DADI	0.6821
MIDDLE EAST PHARMA. & CHMICAL IND. & MEDICAL APPLIANCES	MPHA	0.1475
THE JORDANIAN PHARMACEUTICAL MANUFACTURING	JPHM	0.2801
THE INDUSTRIAL COMMERCIAL & AGRICULTURAL	ICAG	0.4500
JORDAN INDUSTRIAL RESOURCES	JOIR	0.3301
THE ARAB PESTICIDES & VETERINARY DRUGS MFG. CO.	MBED	0.7380
AL-EQBAL INVESTMENT COMPANY LTD	ITCC	0.4306
UNION TOBACCO & CIGARETTE INDUSTRIES	UTOB	0.3799
JORDAN PHOSPHATE MINES	JOPH	0.1153
THE JORDAN CEMENT FACTORIES	JOCM	0.1751
THE ARAB POTASH	APOT	0.0232
JORDAN STEEL	JOST	0.8620
NATIONAL ALUMINIUM INDUSTRIAL	NATA	0.6350
READY MIX CONCRTE AND CONSTRUCTION SUPPLIES	RMCC	0.3200
NATIONAL CABLE & WIRE MANUFACTURING	WIRE	0.5037
JORDAN NEW CABLE	JNCC	0.3728
UNITED CABLE INDUSTRIES	UCIC	0.5035
THE JORDAN WORSTED MILLS	JOWM	0.5490

Appendix (A2)

How to derive VaR figures from probability distributions.

The daily earnings at risk (DEaR) estimate for our combined trading activities averaged approximately $15 million.

J.P.Morgan 1994 Annual Report

Perhaps the greatest advantage of value at risk (VaR) is that it summarizes in single, to understand number the downside risk of an institution due to financial market variables. No doubt this explains why VaR is fast becoming an essential tool for conveying trading risks to senior management, directors, and shareholders. J.P. Morgan, for example was one of the first users of VaR. it revealed in its 1994 Annual Report that its trading VaR was an average of $15 million at the 95 percent level over 1 day. Shareholders can then assess whether they are comfortable with this level of risk. Before such figures were released shareholders had only a vague idea of the extent of trading activities assumed by the bank.

This section turns to a formal definition of value at risk (VaR). VaR assumes that the portfolio is "frozen" over the horizon or, more generally, that the risk profile of the institution remains constant. In addition, VAR assumes that the current portfolio will be marked-to-market on the target horizon(Jorion 2001).

Section 5.5.1 shows how to derive VAR figures from probability distributions. This can be done in two ways, either from considering the actual empirical distribution or by approximation the distribution by a parametric approximation, such as the normal distribution, in which case VAR is derived from the standard deviation.

5.5.1 Calculating VaR

With all the requisite tools in place, we can now formally define the vale at risk (VaR) of a portfolio. VAR summarizes the expected maximum loss (or worst loss) over a target horizon within a given confidence interval. Initially, we take the quantitative factors, the horizon and confidence level, as given(Jorion, 2001).

5.5.1.1 Steps in Constructing VaR

Assume, for instance, that we need to measure the VaR of a $100 million equity portfolio over 10days at the 99 percent confidence level. The following steps are required to compute VAR(Jorion,2001) :

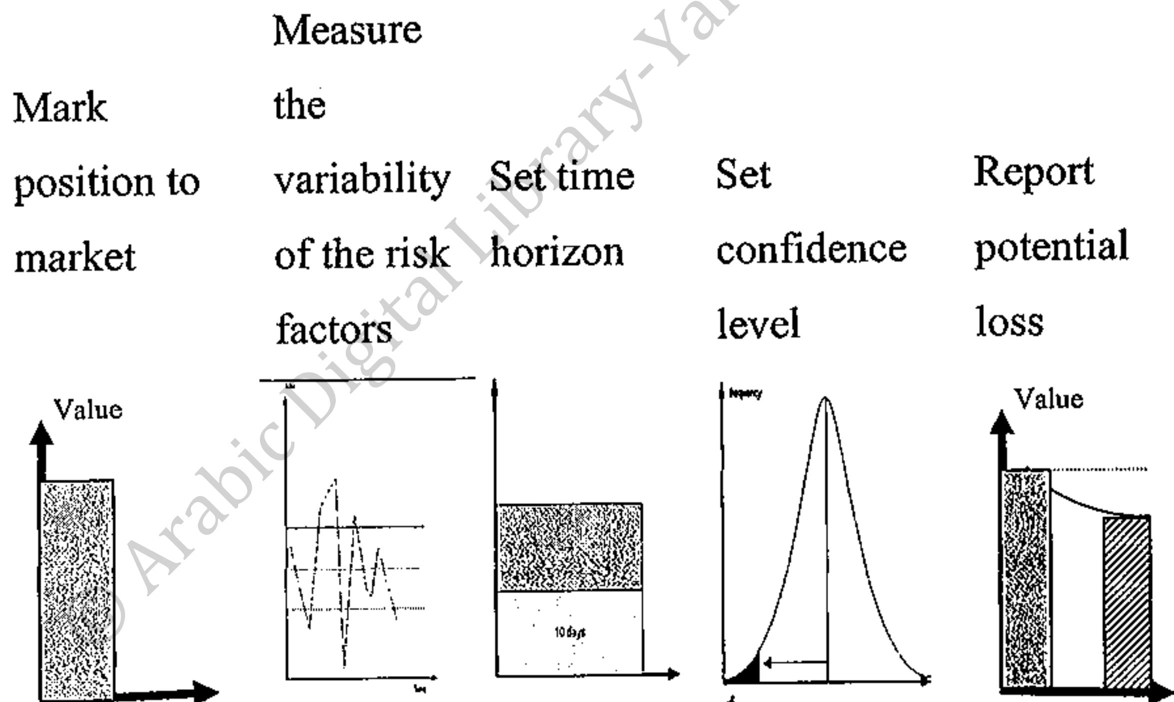
- Mark-to-market of the current portfolio (e.g.,$100 million).
- Measure the variability of the risk factors(s) (e.g., 15 percent per annum).
- Set the time horizon, or the holding period (e.g., adjust to 10 business days).

- Set the confidence level (e.g., 99 percent, which yields a 2.33 factor assuming a normal distribution).
- Report the worst loss by processing all the preceding information (e.g., a $7 million VAR).

These steps are illustrated in figure 5.2. The precise detail of the computation is described next.

FIGURE 5.2 (Jorion, 2001).

Steps in constructing VaR.



Sample computation :

\$100M * **15** * $\sqrt{(10/252)}$ * **2.33** = **\$7M**

5.5.1.2 VaR for General Distributions

To compute the VaR of a portfolio, define W_0 as the initial investment and R as its rate of return. The portfolio value at the end of the target horizon is W= W_0 (1+R*). As before return and volatility of R are μ and σ . Define now the lowest portfolio value at the given confidence level c as $W^* = W_0(1+R^*)$. The relative VaR is defined as the dollar loss relative to the mean:

$$\text{VaR (mean)} = E(W) - W^* = - W_0 (R^* - \mu) \qquad (1)$$

Sometimes VaR is defined as the absolute VaR, that is, the dollar loss relative to zero or without reference to the expect value:

$$\text{VAR (zero)} = W_0 - W^* = - W_0 R^* \qquad (2)$$

In both cases, finding VaR is equivalent to identifying the minimum value W* or the cutoff return R* (Jorion, 2001) .

If the horizon is short, the return could be small, in which case both methods will give similar results. Otherwise, relative VaR is conceptually more appropriate because it views risk in terms of a deviation from the mean, or "budget," on the target data, appropriately accounting of the time value of money. This approach is also more conservative if the mean value is positive. Its only drawback is that the mean return is sometimes difficult to estimate.

In its most general form, VaR can be derived from the probability distribution of the future portfolio value $f(w)$. At a given confidence level c, we wish to find the worst possible

realization W* such that the probability of exceeding this value is c:

$$C = \int_{w^*}^{\infty} f(w)dw$$

Or such that the probability of a value lower than W*, p=P(w≤ W*), is 1 – c:

$$1 - c = \int_{-\infty}^{w^*} f(w)dw = P(w \leq W^*) = P$$

In other words, the area from - ∞ to W* must sum to P=1-c, for instance, 5 percent. The number W*is called the quintile of the distribution, which is the cutoff value with a fixed probability of being exceeded. Note that we did not use the standard deviation to find the VaR (Jorion, 2001) .

This specification is valid for any distribution, discrete or continuous, fat- or thin-tailed. Figure 5-2, for instance, reports J.P. Morgan's distribution of daily revenues in 1994.

To compute VaR, assume that daily revenues are identically and independently distributed. We can then derive the VaR at the 95 percent confidence level from the 5 percent left-side "losing tail" from the histogram.

From this graph, the average revenue is about $5.1 million. There is a total of 254 observation; therefore, we would like to find W* such that the number of observations to its left is 254*5 percent = 12.7. we have 11 observations to the left of -$10 million and 15 to the left of -$9 million. Interpolating, we find W* = -

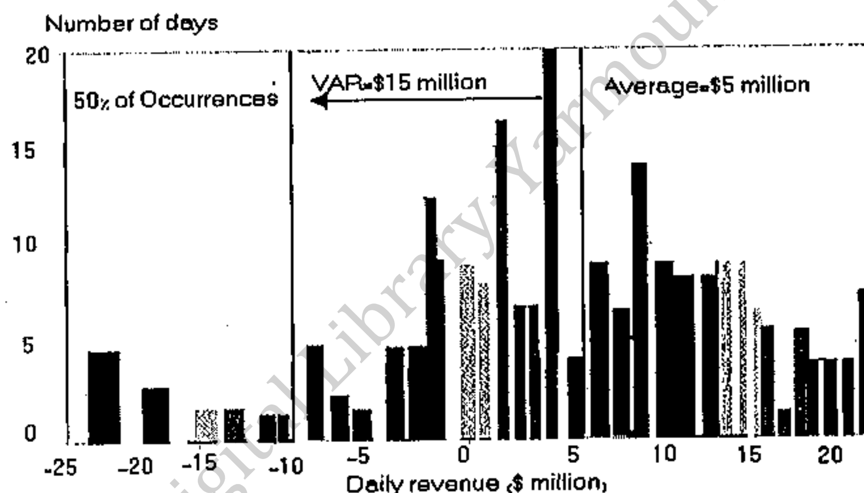
\$9.6 million. The VaR of daily revenues, measured relative to the mean, is

$$VaR = E(W) - W^* = \$5.1 \text{ million} - (-\$9.6 \text{ million}) = \$14.7$$

million. If one wishes to measure VAR in terms of absolute dollar loss, VAR is then \$9.6 million.

Figure 5.3

Distribution of daily revenues (Jorion, 2001).



5.1.3 VaR for Parametric Distributions

The VaR computation can be simplified considerably if the distribution can be assumed to belong to a parametric family, such as the normal distribution. When this is the case, the VaR figure can be derived directly from portfolio deviation using multiplicative factor that depends on the confidence level. This approach is sometimes called parametric because it involves estimation of parameters, such as the standard deviation, instead of just reading the quantile off the empirical distribution.

This method is simple and convenient and, produces more accurate measures of VaR. The issue is whether the normal approximation is realistic. If not, another distribution may fit the data better (Jorion,2001) .

First, we need to translate the general distribution f (w) into a standard normal distribution Φ (ϵ), where ϵ has mean zero and standard deviation of unity. We associate W* with the cutoff return R* such that $W^* = W_0 (1+R^*)$. Generally, R* is negative and also can be written as $-|R^*|$. Further, we can associate R* with a standard normal deviate $\alpha > 0$ by setting

$$-\alpha = \frac{-|R^*| - \mu}{\sigma}$$

It is equivalent to set

$$1-c = \int_{-\infty}^{W^*} f(w)dw = \int_{-\infty}^{-|R^*|} f(r)dr = \int_{-\infty}^{-\alpha} \Phi(\varepsilon)d\varepsilon$$

Thus the problem of finding a VAR is equivalent to finding the deviate α such that the area to the left of it is equal to 1-c. this is made possible be turning to tables of the *cumulative standard normal distribution function*, which is the area to the left of a standard normal variable with value equal to *d*:

$$N(d) = \int_{-\infty}^{d} \Phi(\varepsilon)d\varepsilon$$

This function also plays a key role in the Black-Scholes option pricing model. Figure 5-3 graphs the cumulative density function N (d), which increases monotonically from 0 (for $d = -\infty$) to 1 (for $d = +\infty$), going through 0.5 as *d* passes through 0.

To find the VAR of a standard normal variable, select the desired left-tail confidence level on the vertical axis, say 5 percent. This corresponds to a value of $\alpha = 1.65$ below 0. We then retract our steps, back from the α we just found to the cutoff return R* and VAR. from Equation (5.5), the cutoff return is

$$R^* = -\alpha\sigma + \mu \tag{5.8}$$

For more generality, assume now that the parameters μ and σ are expressed on an annual basis. The time interval considered is Δt, in years. We can use the time aggregation results developed in the preceding chapter, which assume uncorrelated returns.
Using Equation (5.1), we find VAR below the mean as

$$\text{VaR(mean)} = -Wo(R^* - \mu) = Wo\alpha\sigma\sqrt{\Delta t} \tag{5.9}$$

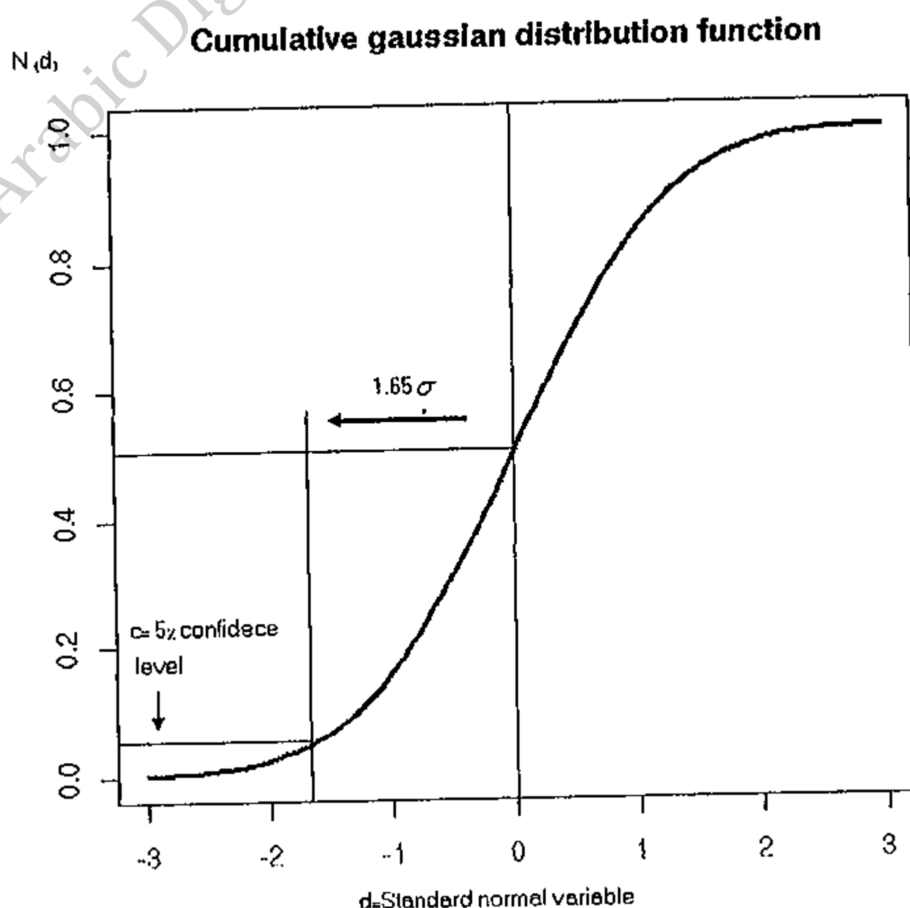
In other words, the VAR figure is simply a multiple of the standard deviation of the distribution times an adjustment factor that is directly related to the confidence level and horizon.

When VAR is defined as an absolute dollar loss, we have

$$VAR(zero)= -WoR^{*}= Wo(\alpha\sigma\sqrt{\Delta t}-\mu\Delta t) \quad (5.10)$$

This method generalizes to other cumulative probability functions (cdf) as well as the normal, as long as all the uncertainty is contained in α. other distributions will entail different values of σ, the normal distribution is just particularly easy to deal with because it adequately represents many empirical distributions. This is especially true for large, well diversified portfolios but certainly not for portfolios with heavy option components and exponents and exposures to a small number of financial risks(Jorion, 2001) .

Figure 5.4 Cumulative normal probability distribution

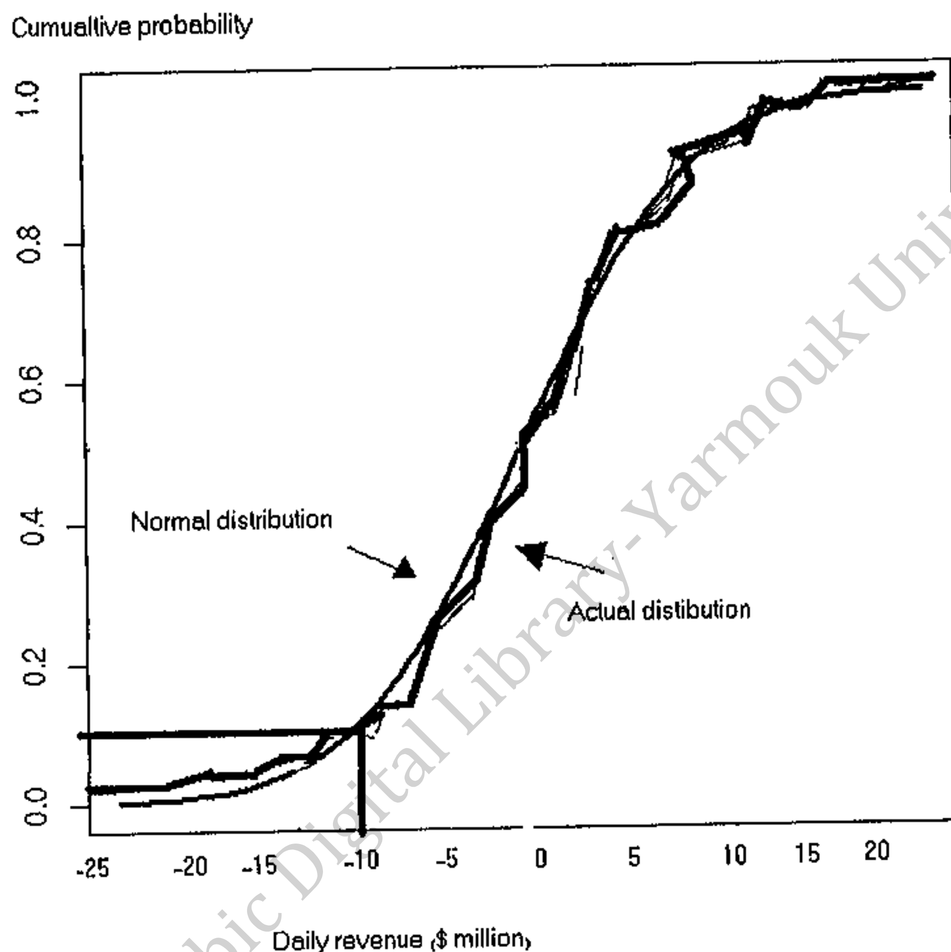


5.1.4 Comparison of Approaches (Jorion, 2001) .

How well does this approximation work? For some distributions, the fit can be quite good. Consider, for instance, the daily revenues in Figure 5-2.The standard deviation of the distribution in \$9.2 million. According to Equation (5.9), the normal-distribution VAR is $\alpha * (\sigma W_0) = 1.65 * \$9.2$ million = \$15.2 million. Note that this number is very close to the VAR obtained from the general distribution, which was \$14.7 million.

Indeed, Figure5-4 presents the cumulative distribution functions (cdf) obtained from the histogram in Figure 5.3 and from its normal approximation. The actual cdf is obtained from summing, starting from the left, all numbers of occurrences in Figure 5.3 and then scaling by the total number of observations. The normal cdf is the same as that in figure 5.4, with the horizontal axis scaled back into dollar revenues using Equation (5.8). The tow lines are generally very close, suggesting that the normal approximation provides a good fit to the actual data.

Figure 5-5 The normal cdf with the horizontal axis scaled back into dollar revenues using Equation (5.8)



5.1.5 VAR as a Risk Measur (Jorion, 2001) .

VAR's heritage can be traced to Markowitz's (1952) seminal work on portfolio choice. He noted that "you should be interested in risk as well as return" and advocated the use of the standard deviation as an intuitive measure of dispersion.

Much of Markowitz's work was devoted to studying the tradeoff between expected return and risk in the mean-variance framework, which is appropriate when either return are normally distributed or investors have quadratic utility functions.

Perhaps the first mention of confidence-based risk measures can be traced to Roy (1952), who presented a "safety first" criterion for portfolio selection. He advocated choosing portfolios that minimize the probability of a loss greater than a disaster level, Baumol (1963) also proposed a risk measurement criterion based on a lower confidence limit at some probability level:

$$L = \alpha\sigma - \mu \qquad (5.11)$$

Which is an early description of Equation (5.10).

Other measures of risk have also been proposed, including semideviation, which counts only deviations below a target value, and lower partial moments, which apply to a wider range of utility functions.

More recently, Artzner et al. (1999) list four desirable properties for risk measures for capital adequacy purposes. A risk measure can be viewed as a function of the distribution of portfolio value W which is summarized into a single number p(W):

- *Monotonicity* : if $W_1 \leq W_2$, $p(W_1) \geq p(W_2)$, or if a portfolio has systematically lower returns than another for all states of the world, its risk must be greater.
- *Translation invariance.* $p(W+K) = p(W) - K$, or adding cash K to a portfolio should reduce its risk by K.
- *Homogeneity.* $p(bW) = bp(W)$, or increasing the size of a portfolio by b should simply scale its risk by the same

factor (this rules out liquidity effects for lage portfolios, however).

- *Subadditivity.* $p(W_1 + W_2) \leq p(W_1) + p(W_2)$, or merging portfolios cannot increase risk.

Artzner et al. (1999) show that the quantile –based VAR measure fails to satisfy the last property. Indeed, one can come up with pathologic examples of short option positions that can crate large losses with a low probability and hence have low VAR yet combine to crate portfolios with larger VAR. one can also show that the shortfall measure $E(-X|X \leq -VAR)$, which is the expected loss conditional on exceeding VAR, satisfies these desirable "coherence" properties.

When returns are normally distributed, however, the standard deviation-based VAR satisfies the last property, $\sigma(W_1 + W_2) \leq \sigma(W_1) + \sigma(W_2)$. Indeed, as Markowitz had shown, the volatility of a portfolio is less than the sum of volatilities.

Of course, the preceding discussion does not consider another essential component for portfolio comparisons: expected returns. In practice one obviously would want to balance increasing risk against in creasing expected returns. The great benefit of VAR, however, is that it brings attention and transparency to the measure of risk, a component of the decision process that is not intuitive and as a result too often ignored.

Appendix (A3)

Performance of the Amman Stock Exchange in 2009

First: Secondary Market (from annual report of Amman stock exchange 2009)

Value of trading at the secondary market including the first and second markets, the bonds market and the transactions excluded from trading mounted to JD 9886 million by the end of 2009 compared with JD 20938 million for 2008 with a decrease of 52.8%. The value of stocks traded through the trading system (the first and second markets) made up 97.8% of the total trading value at the secondary market. The following outlines the secondary market activity during 2009:

A- First and Second Markets

Shares of 237 companies were traded in 2009 with 79 companies shares marking an increase and shares of 153 companies decreasing and 5 companies shares remained stable. Performance indicators for the first and second markets reveal a decrease of 52.4% in the trading volume compared with 2008, also the number of transactions executed decreased by 21.6%, While the number of traded shares in 2009 increased by 10.7% compared with 2008 (annual report of ASE 2009).

Sectoral distribution of trading value and number of traded shares showed the financial sector ranked first in terms of trading volume and number of traded shares, followed by the services sector, and the industrial sector. Trading in the sectors of real estate, diversified financial services, banks, commercial services, and mining and extraction industries, made up 30.4%, 20.8%, 9.8%, 9.3%, and 7.1%, respectively of the total trading value. Daily trading averages showed a decrease in the daily average trading value to JD38.8 million against JD82.9 million in 2008, a decrease of 53.2%.

In terms of turnover ratio, the services sector ranked with 115.1% followed by the financial sector with 103.7%, and the industrial sector with a 47.1%. Overall, the turnover ratio at the ASE during 2009 was 91.3% compared to 91.5% in 2008

(annual report of ASE 2009).

B- Shares Price Indices:

The price index, weighted by market capitalization of free float shares, decreased by 8.2 in 2009 reaching 2534 points, and the price index weighted by market capitalization stood at to 5520 points by the end of 2009 a decrease of 11.6%, the un-weighted price index also dropped by 14.4% in 2009 to 1058 points.

At the sector level, the financial sector index dropped by 16.1% compared with 2008 due to the decrease of all sub-sector indices. The banks sector which represented more than 63% of the

financial sector index decreased by 13.1% during the year 2009, and the real estate sector which affected the financial sector index of more than 15%; declined by 19.3%. The services sector index increased by 4.1% due to the increase in most of the sub-sector indices especially the 24.1% increase in the utilities and energy sector index, this sector contribute to more than 39% of the services sector index. Moreover, the industrial sector index rose by 0.10% due to the increase in the mining and extraction industries sector by 4.7%, causing more than 61% of the industrial sector increase.

The tobacco and cigarettes, utilities and energy, chemical industries, transportation, mining and extraction industries, commercial services, pharmaceutical and medical industries and technology and communications sectors were the most advanced sectors during the year 2009 where these sectors rose by 28.4%,24.1%,12.0%,7.5%,4.7%,4.5%, 4.2% and 3.9% respectively. While the paper and cardboard industries, engineering and construction and diversified financial services sectors, were the biggest losers, those sectors declined by 35.6%, 32.3% and 24.6% respectively (annual report from ASE 2009).

As a result of the declined in shares prices, the market capitalization of listed companies dropped by 11.3% at the end of 2009 representing 149.6% of GDP.

C- Bonds Market

Value of bonds traded during the year amounted to JD2.5 million with an increase of 317.6% compared with 2008; the number of traded bonds was 0.8 thousand an increase of 82.5%. It should be noted that only corporate bonds were traded during 2009, while no trading took place at government bonds.

D- Transactions Excluded from Trading Data issued by the SDC showed that the amount of transactions excluded from trading system decreased in 2009. These transactions included inheritance and family transfers, companies excluded from trading, and other transactions. Transactions excluded from trading counted for JD218.0 million in 2009 compared with JD618.0 million in 2008. However, the number of shares transferred during 2009 counted for 73.2 million shares compared with 135.1 million shares in 2008 (annual report of ASE 2009).